

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2005/010912

International filing date: 31 March 2005 (31.03.2005)

Document type: Certified copy of priority document

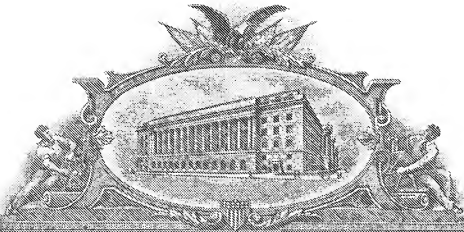
Document details: Country/Office: US
Number: 60/559,203
Filing date: 01 April 2004 (01.04.2004)

Date of receipt at the International Bureau: 12 August 2005 (12.08.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 02, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/559,203

FILING DATE: April 01, 2004

RELATED PCT APPLICATION NUMBER: PCT/US05/10912



Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

16085 U.S. PTO
040104

PTO/SB/16 (08-03)
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EL 961008118 US

22154 U.S. PTO
607559203

INVENTOR(S)			
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)	
Steven Andreas Stefan M.	MAH BRAUN KAMMERER	San Diego, California San Diego, California San Diego, California	
Additional inventors are being named on the <u>1</u> separately numbered sheets attached hereto			
TITLE OF THE INVENTION (500 characters max)			
METHODS FOR IDENTIFYING RISK OF OSTEOARTHRITIS AND TREATMENTS THEREOF			
Direct all correspondence to: CORRESPONDENCE ADDRESS			
<input checked="" type="checkbox"/> Customer Number: <u>25225</u> OR <input type="checkbox"/> Firm or Individual Name			
Address			
City		State	Zip
Country		Telephone	Fax
ENCLOSED APPLICATION PARTS (check all that apply)			
<input checked="" type="checkbox"/> Specification Number of Pages <u>331</u>		<input type="checkbox"/> CD(s), Number <u> </u>	
<input checked="" type="checkbox"/> Drawing(s) Number of Sheets <u>3</u>		<input checked="" type="checkbox"/> Other <u> </u>	
<input checked="" type="checkbox"/> Application Data Sheet. See 37 CFR 1.76 (4 pages)		(specify): <u>Return Receipt Postcard</u>	
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT			
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.			
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees.			
<input checked="" type="checkbox"/> The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: <u>03-1952</u>			
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.			
FILING FEE AMOUNT (\$) <u>80.00</u>			
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.			
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are:			

[Page 1 of 2]

Respectfully submitted,

SIGNATURE
TYPED OR
PRINTED NAME

Bruce D. Grant

TELEPHONE

(858) 720-7962

Date April 1, 2004

REGISTRATION NO. 47,608
(if appropriate)

Docket Number: 524593008800

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as Express Mail, Airbill No. EL 961008118 US, in an envelope addressed to: Mail Stop Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date shown below.

Dated: 4/1/04 Signature: Deborah Wykes (Deborah Wykes)

PROVISIONAL APPLICATION COVER SHEET
Additional Page

PTO/SB/16 (08-03)

Approved for use through 07/31/06. OMB 0651-0032

U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Docket Number 524593008800

INVENTOR(S)/APPLICANT(S)		
Given Name (first and middle (if any))	Family or Surname	Residence (City and either State or Foreign Country)
Matthew Roberts Rikard Henry Maria L.	NELSON RENELAND LANGDOWN	San Marcos, California San Diego, California San Diego, California

[Page 2 of 2]

METHODS FOR IDENTIFYING RISK OF OSTEOARTHRITIS AND TREATMENTS THEREOF

Field of the Invention

[0001] The invention relates to genetic methods for identifying risk of osteoarthritis and treatments that specifically target such diseases.

Background

[0002] Osteoarthritis (OA) is a chronic disease usually affecting weight-bearing synovial joints. There are approximately 20 million Americans affected by OA and it is the leading cause of disability in the United States. In addition to extensive human suffering, OA also accounts for nearly all knee replacements and more than half of all hip replacements in the United States. Despite its prevalence, OA is poorly understood and there are few treatments available besides anti-inflammatory drugs and joint replacement.

[0003] Most commonly affecting middle-aged and older people, OA can range from very mild to very severe. It affects hands and weight-bearing joints such as knees, hips, feet and the back. Knee OA can be as disabling as any cardiovascular disease except stroke.

[0004] OA is characterized by the breakdown of cartilage in joints. Cartilage in joints cushions the ends of bones, and cartilage breakdown causes bones to rub against each other, causing pain and loss of movement. Type II collagen is the main component of cartilage, comprising 15-25% of the wet weight, approximately half the dry weight, and representing 90-95% of the total collagen content in the tissue. It forms fibrils that endow cartilage with tensile strength (Mayne, R. Arthritis Rheum. 32:241-246 (1989)).

Summary

[0005] It has been discovered that certain polymorphic variations in human genomic DNA are associated with osteoarthritis. In particular, polymorphic variants in a locus containing *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* and *GPR50* regions in human genomic DNA have been associated with risk of osteoarthritis.

[0006] Thus, featured herein are methods for identifying a subject at risk of osteoarthritis and/or a risk of osteoarthritis in a subject, which comprise detecting the presence or absence of one or more polymorphic variations associated with osteoarthritis in or around the loci described herein in a human nucleic acid sample. In an embodiment, two or more polymorphic variations are detected in two or more regions of which one is the *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50*

region. In certain embodiments, 3 or more, or 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 or more polymorphic variants are detected.

[0007] Also featured are nucleic acids that include one or more polymorphic variations associated with occurrence of osteoarthritis, as well as polypeptides encoded by these nucleic acids. In addition, provided are methods for identifying candidate therapeutic molecules for treating osteoarthritis, as well as methods for treating osteoarthritis in a subject by identifying a subject at risk of osteoarthritis and treating the subject with a suitable prophylactic, treatment or therapeutic molecule.

[0008] Also provided are compositions comprising a cell from a subject having osteoarthritis or at risk of osteoarthritis and/or a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleic acid, with a RNAi, siRNA, antisense DNA or RNA, or ribozyme nucleic acid designed from a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence. In an embodiment, the RNAi, siRNA, antisense DNA or RNA, or ribozyme nucleic acid is designed from a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence that includes one or more polymorphic variations associated with osteoarthritis, and in some instances, specifically interacts with such a nucleotide sequence. Further, provided are arrays of nucleic acids bound to a solid surface, in which one or more nucleic acid molecules of the array have a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence, or a fragment or substantially identical nucleic acid thereof, or a complementary nucleic acid of the foregoing. Featured also are compositions comprising a cell from a subject having osteoarthritis or at risk of osteoarthritis and/or a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* polypeptide, with an antibody that specifically binds to the polypeptide. In an embodiment, the antibody specifically binds to an epitope in the polypeptide that includes a non-synonymous amino acid modification associated with osteoarthritis (e.g., results in an amino acid substitution in the encoded polypeptide associated with osteoarthritis). Thus, featured is an antibody that selectively binds to an epitope in a *APOB* polypeptide having an amino acid encoded by a polymorphic site associated with osteoarthritis (e.g., an epitope comprising a threonine or isoleucine encoded by rs1367117 (e.g., a threonine at position 98 in an *APOB* polypeptide)).

Brief Description of the Drawings

[0009] Figures 1A-1F show proximal SNPs in *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *LOXL1* and *CASPR4* regions of genomic DNA, respectively. The position of each SNP in the chromosome is shown on the x-axis and the y-axis provides the negative logarithm of the p-value comparing the estimated allele to that of the control group. Also shown in the figures are exons and introns of the regions in the approximate chromosomal positions.

Detailed Description

[0010] It has been discovered that a polymorphic variant in a locus containing a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* region is associated with occurrence of osteoarthritis in subjects. Thus, detecting genetic determinants associated with an increased risk of osteoarthritis occurrence can lead to early identification of a predisposition to osteoarthritis and early prescription of preventative measures. Also, associating a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* polymorphic variant with osteoarthritis has provided new targets for screening molecules useful in treatments of osteoarthritis.

Osteoarthritis and Sample Selection

[0011] Osteoarthritis (OA), or degenerative joint disease, is one of the oldest and most common types of arthritis. It is characterized by the breakdown of the joint's cartilage. Cartilage is the part of the joint that cushions the ends of bones, and its breakdown causes bones to rub against each other, causing pain and loss of movement. Type II collagen is the main component of cartilage, comprising 15-25% of the wet weight, approximately half the dry weight, and representing 90-95% of the total collagen content in the tissue. It forms fibrils that endow cartilage with tensile strength (Mayne, R. Arthritis Rheum. 32:241-246 (1989)).

[0012] Most commonly affecting middle-aged and older people, OA can range from very mild to very severe. It affects hands and weight-bearing joints such as knees, hips, feet and the back. Knee OA can be as disabling as any cardiovascular disease except stroke.

[0013] Osteoarthritis affects an estimated 20.7 million Americans, mostly after age 45, with women more commonly affected than men. Physicians make a diagnosis of OA based on a physical exam and history of symptoms. X-rays are used to confirm diagnosis. Most people over 60 reflect the disease on X-ray, and about one-third have actual symptoms.

[0014] There are many factors that can cause OA. Obesity may lead to osteoarthritis of the knees. In addition, people with joint injuries due to sports, work-related activity or accidents may be at increased risk of developing OA.

[0015] Genetics has a role in the development of OA. Some people may be born with defective cartilage or with slight defects in the way that joints fit together. As a person ages, these defects may cause early cartilage breakdown in the joint or the inability to repair damaged or deteriorated cartilage in the joint.

[0016] Inclusion or exclusion of samples for an osteoarthritis pool may be based upon the following criteria: ethnicity (e.g., samples derived from an individual characterized as Caucasian); parental

ethnicity (e.g., samples derived from an individual of British paternal and maternal descent); relevant phenotype information for the individual (e.g., case samples derived from individuals diagnosed with specific knee osteoarthritis (OA) and were recruited from an OA knee replacement clinic). Control samples may be selected based on relevant phenotype information for the individual (e.g., derived from individuals free of OA at several sites (knee, hand, hip etc)); and no family history of OA and/or rheumatoid arthritis. Additional phenotype information collected for both cases and controls may include age of the individual, gender, family history of OA, diagnosis with osteoarthritis (joint location of OA, date of primary diagnosis, age of individual as of primary diagnosis), knee history (current symptoms, any major knee injury, meniscectomy, knee replacement surgery, age of surgery), HRT history, osteoporosis diagnosis.

[0017] Based in part upon selection criteria set forth above, individuals having osteoarthritis can be selected for genetic studies. Also, individuals having no history of osteoarthritis often are selected for genetic studies, as described hereafter.

Polymorphic Variants Associated with Osteoarthritis

[0018] A genetic analysis provided herein linked osteoarthritis with polymorphic variant nucleic acid sequences in the human genome. As used herein, the term “polymorphic site” refers to a region in a nucleic acid at which two or more alternative nucleotide sequences are observed in a significant number of nucleic acid samples from a population of individuals. A polymorphic site may be a nucleotide sequence of two or more nucleotides, an inserted nucleotide or nucleotide sequence, a deleted nucleotide or nucleotide sequence, or a microsatellite, for example. A polymorphic site that is two or more nucleotides in length may be 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or more, 20 or more, 30 or more, 50 or more, 75 or more, 100 or more, 500 or more, or about 1000 nucleotides in length, where all or some of the nucleotide sequences differ within the region. A polymorphic site is often one nucleotide in length, which is referred to herein as a “single nucleotide polymorphism” or a “SNP.”

[0019] Where there are two, three, or four alternative nucleotide sequences at a polymorphic site, each nucleotide sequence is referred to as a “polymorphic variant” or “nucleic acid variant.” Where two polymorphic variants exist, for example, the polymorphic variant represented in a minority of samples from a population is sometimes referred to as a “minor allele” and the polymorphic variant that is more prevalently represented is sometimes referred to as a “major allele.” Many organisms possess a copy of each chromosome (e.g., humans), and those individuals who possess two major alleles or two minor alleles are often referred to as being “homozygous” with respect to the polymorphism, and those individuals who possess one major allele and one minor allele are normally referred to as being “heterozygous” with respect to the polymorphism. Individuals who are homozygous with respect to one

allele are sometimes predisposed to a different phenotype as compared to individuals who are heterozygous or homozygous with respect to another allele.

[0020] In genetic analysis that associate polymorphic variants with osteoarthritis, samples from individuals having osteoarthritis and individuals not having osteoarthritis often are allelotyped and/or genotyped. The term “allelotype” as used herein refers to a process for determining the allele frequency for a polymorphic variant in pooled DNA samples from cases and controls. By pooling DNA from each group, an allele frequency for each SNP in each group is calculated. These allele frequencies are then compared to one another. The term “genotyped” as used herein refers to a process for determining a genotype of one or more individuals, where a “genotype” is a representation of one or more polymorphic variants in a population.

[0021] A genotype or polymorphic variant may be expressed in terms of a “haplotype,” which as used herein refers to two or more polymorphic variants occurring within genomic DNA in a group of individuals within a population. For example, two SNPs may exist within a gene where each SNP position includes a cytosine variation and an adenine variation. Certain individuals in a population may carry one allele (heterozygous) or two alleles (homozygous) having the gene with a cytosine at each SNP position. As the two cytosines corresponding to each SNP in the gene travel together on one or both alleles in these individuals, the individuals can be characterized as having a cytosine/cytosine haplotype with respect to the two SNPs in the gene.

[0022] As used herein, the term “phenotype” refers to a trait which can be compared between individuals, such as presence or absence of a condition, a visually observable difference in appearance between individuals, metabolic variations, physiological variations, variations in the function of biological molecules, and the like. An example of a phenotype is occurrence of osteoarthritis.

[0023] Researchers sometimes report a polymorphic variant in a database without determining whether the variant is represented in a significant fraction of a population. Because a subset of these reported polymorphic variants are not represented in a statistically significant portion of the population, some of them are sequencing errors and/or not biologically relevant. Thus, it is often not known whether a reported polymorphic variant is statistically significant or biologically relevant until the presence of the variant is detected in a population of individuals and the frequency of the variant is determined. Methods for detecting a polymorphic variant in a population are described herein, specifically in Example 2. A polymorphic variant is statistically significant and often biologically relevant if it is represented in 5% or more of a population, sometimes 10% or more, 15% or more, or 20% or more of a population, and often 25% or more, 30% or more, 35% or more, 40% or more, 45% or more, or 50% or more of a population.

[0024] A polymorphic variant may be detected on either or both strands of a double-stranded nucleic acid. Also, a polymorphic variant may be located within an intron or exon of a gene or within a portion

of a regulatory region such as a promoter, a 5' untranslated region (UTR), a 3' UTR, and in DNA (e.g., genomic DNA (gDNA) and complementary DNA (cDNA)), RNA (e.g., mRNA, tRNA, and rRNA), or a polypeptide. Polymorphic variations may or may not result in detectable differences in gene expression, polypeptide structure, or polypeptide function.

[0025] It was determined that polymorphic variations associated with an increased risk of osteoarthritis existed in *PADI2*, *APOB*, *IL1RL2*, *WASPI*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* and *GPR50* regions. In certain embodiments, polymorphic variants at positions rs910223, rs1367117, rs1024791, rs1465621, rs1018810, rs242392, rs8818, rs1395486 and rs512294 in the human genome were associated with an increased risk of osteoarthritis, and in specific embodiments, an adenine at position rs910223, a guanine at position rs1367117, a guanine at position rs1024791, an adenine at position rs1465621, an adenine at position rs1018810, a thymine at position rs242392, a cytosine at position rs8818, a thymine at position rs1395486 and a guanine at position rs512294 were associated with an increased risk of osteoarthritis.

[0026] Polymorphic variants in and around the *APOB* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 1 selected from the group consisting of 238, 294, 295, 347, 1425, 4891, 5087, 7041, 7121, 7219, 7443, 7485, 10939, 11367, 11571, 11839, 12551, 12646, 13469, 14913, 15205, 15246, 15695, 17473, 17610, 17828, 18130, 18281, 18623, 18890, 21561, 23100, 23872, 24581, 24582, 24983, 27540, 30846, 31415, 31453, 31899, 37000, 38681, 39287, 42951, 45648, 46222, 46687, 47020, 47593, 48513, 49723, 49986, 53018, 53296, 53547, 53899, 53916, 53933, 54305, 55327, 55895, 56143, 56640, 58486, 59576, 63048, 64008, 64018, 64859, 65995, 66905, 67183, 67942, 68101, 68521, 68664, 68988, 69178, 72143, 74183, 74312, 74407, 75518, 76153, 77398, 77615, 79092, 80000, 80125, 80595, 81061, 81151, 81918, 83072, 83137, 83235, 83263, 83279, 83280, 83533, 86856, 87186, 87189, 87727, 87978, 89129, 89556, 89702, 90233, 93060, 94779, 95367, 95844, 95942, 96884, 96938, 97627, 97777, 97871, 98746 and 99663. Polymorphic variants at the following positions in SEQ ID NO: 1 in particular were associated with an increased risk of osteoarthritis: 7219, 7485, 11839, 31899, 37000, 48513, 49986, 56640, 74407, 77398, 93060 and 97627. In particular, the following polymorphic variants in SEQ ID NO: 1 were associated with risk of osteoarthritis: an adenine at position 7219, a guanine at position 7485, an adenine at position 11839, a thymine at position 31899, an adenine at position 37000, a cytosine at position 48513, a guanine at position 49986, a guanine at position 56640, a cytosine at position 74407, a guanine at position 77398, an adenine at position 93060 and an adenine at position 97627. A threonine at amino acid position 98 in an *APOB* polypeptide was associated with increased risk of osteoarthritis (i.e., an isoleucine to threonine non-synonymous variation).

[0027] Polymorphic variants in and around the *ILIRL2* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 2 selected from the group consisting of 225, 509, 860, 874, 939, 1483, 1798, 2189, 2215, 2282, 2340, 2963, 3369, 3481, 3564, 3653, 4860, 4941, 4975, 5321, 5346, 5541, 5633, 6007, 6317, 6378, 6382, 6426, 6479, 6641, 6703, 6705, 7963, 8525, 8526, 8598, 8624, 8883, 8980, 13578, 16135, 16141, 16642, 16931, 17004, 17009, 17010, 18713, 18853, 20783, 21335, 22180, 22268, 22285, 25378, 25906, 26015, 26475, 26798, 27042, 27649, 27827, 27873, 28122, 28202, 28232, 28240, 29546, 29748, 30054, 30646, 31149, 36912, 36936, 37184, 39064, 39343, 40868, 40917, 41113, 47343, 47806, 47911, 48009, 48621, 49245, 49247, 49299, 49302, 49514, 49626, 49791, 50010, 50294, 51482, 51556, 51855, 51956, 52155, 52448, 52458, 52511, 52607, 54049, 54224, 54567, 55052, 55857, 55941, 56120, 56349, 56727, 57232, 58806, 61181, 63808, 64526, 64865, 64928, 64966, 65080, 65690, 66228, 66982, 72511, 74170, 74264, 74333, 74502, 74741, 75321, 82558, 85366, 85469, 86485, 87687, 89463, 89660, 95718 and 95821. Polymorphic variants at the following positions in SEQ ID NO: 2 in particular were associated with an increased risk of osteoarthritis: 2215, 3369, 16642, 20783, 52155, 55052, 55941, 74333, 74741, 85366, 85469, 87687, 89660 and 95718, where specific embodiments are directed to position 52155. In particular, the following polymorphic variants in SEQ ID NO: 2 were associated with risk of osteoarthritis: an adenine at position 2215, a deletion at position 3369, a deletion at position 16642, a cytosine at position 20783, a cytosine at position 52155, a cytosine at position 55052, a cytosine at position 55941, a thymine at position 74333, an adenine at position 74741, a deletion at position 85366, a thymine at position 85469, a thymine at position 87687, an adenine at position 89660 and a cytosine at position 95718.

[0028] Polymorphic variants in and around the *WASPIP* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 3 selected from the group consisting of 209, 5908, 7460, 7733, 7855, 7904, 8869, 9480, 13820, 15152, 17713, 17804, 18220, 19083, 19123, 19605, 20247, 20592, 21907, 23273, 23299, 23623, 23669, 23844, 24190, 24486, 24896, 25118, 30551, 30844, 30900, 30942, 31699, 32081, 35078, 36196, 36541, 38356, 45578, 49634, 49774, 51119, 51181, 51652, 54467, 55762, 55999, 57865, 66613, 68377, 69754, 72859, 76512, 76717, 77722, 80998, 82033, 89658, 89960, 94155 and 95679. Polymorphic variants at the following positions in SEQ ID NO: 3 in particular were associated with an increased risk of osteoarthritis: 19083, 30900, 38356, 76512 and 94155, where specific embodiments are directed to positions 30900, 76512 and/or 94155. In particular, the following polymorphic variants in SEQ ID NO: 3 were associated with risk of osteoarthritis: a thymine at position 19083, a guanine at position 30900, an adenine at position 38356, an adenine at position 76512 and an adenine at position 94155.

[0029] Polymorphic variants in and around the *BVES* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 4 selected from the group

consisting of 241, 801, 899, 2091, 2290, 2440, 4959, 7914, 7969, 7972, 10831, 12399, 13841, 14461, 14680, 16808, 18231, 18394, 18505, 18684, 19257, 20263, 20656, 21499, 21563, 21612, 21834, 22406, 22408, 22685, 23303, 23306, 25139, 25211, 25364, 25381, 25414, 25835, 26214, 27224, 27526, 27934, 28550, 29015, 29879, 29979, 30030, 30585, 31753, 31934, 33227, 33228, 35172, 36901, 36921, 36932, 37061, 37570, 38745, 38970, 39725, 40070, 40460, 41470, 41562, 41956, 42047, 42280, 42358, 42629, 43075, 43387, 43393, 43438, 44115, 44537, 45642, 46629, 47496, 47515, 48329, 48862, 48908, 49038, 49080, 50204, 50404, 50426, 50531, 50840, 50964, 50971, 51378, 52610, 53906, 53951, 54111, 54149, 55563, 55999, 58415, 58961, 60447, 61377, 61528, 61606, 62140, 62461, 63826, 64950, 65076, 66121, 66406, 67051, 68860, 69014, 70796, 72325, 73414, 75258, 76347, 76839, 77358, 77822, 77946, 80002, 80024, 80285, 80397, 82075, 82153, 83981, 84184, 85089, 85288, 85330, 85581, 85642, 86433, 86904, 88391, 89042, 90828, 92676, 92881, 94227, 94585, 94616, 94712, 94738, 95253, 95522, 95869 and 97856. Polymorphic variants at the following positions in SEQ ID NO: 4 in particular were associated with an increased risk of osteoarthritis: 25414, 25835, 38970, 41470, 44115, 47496, 49038, 50204, 50840, 50964, 50971, 53906, 54149, 58415, 70796, 72325, 75258, 77822, 80002, 85288, 85581, 86904, 90828, 94616, 94712, 95869 and 97856. In particular, the following polymorphic variants in SEQ ID NO: 4 were associated with risk of osteoarthritis: an adenine at position 25414, a cytosine at position 25835, an adenine at position 38970, an adenine at position 41470, an adenine at position 44115, a guanine at position 47496, a cytosine at position 49038, an adenine at position 50204, a thymine at position 50840, a cytosine at position 50964, a cytosine at position 50971, an adenine at position 53906, a guanine at position 54149, a guanine at position 58415, a thymine at position 70796, a guanine at position 72325, a cytosine at position 75258, an adenine at position 77822, an adenine at position 80002, an adenine at position 85288, an adenine at position 85581, a guanine at position 86904, a guanine at position 90828, an adenine thymine adenine adenine sequence at position 94616, a cytosine at position 94712, a guanine at position 95869 and a cytosine at position 97856.

[0030] Polymorphic variants in and around the *LOXLI* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 5 selected from the group consisting of 213, 249, 1824, 2057, 2306, 2869, 3976, 4288, 4290, 4434, 5298, 5467, 8486, 8487, 8831, 9036, 9058, 9131, 9732, 9862, 10191, 10270, 16167, 17620, 17751, 17764, 17787, 19401, 21021, 21902, 22173, 22416, 22653, 24945, 25011, 28563, 48574, 48710, 48880, 50194, 56343, 56455, 56729, 56759, 56895, 57036, 57702, 62515, 62629, 63501, 63547, 64876, 65073, 67149, 67549, 71660, 71906 and 71911. A polymorphic variant at position 65073 in SEQ ID NO: 5, often a guanine, in particular was associated with an increased risk of osteoarthritis.

[0031] Polymorphic variants in and around the *CASPR4* locus were tested for association with osteoarthritis. These include polymorphic variants at positions in SEQ ID NO: 6 selected from the group

consisting of 205, 866, 4212, 5934, 11486, 16969, 22509, 22796, 28097, 28626, 28853, 28873, 30155, 30827, 31956, 32404, 32944, 35205, 35227, 35781, 41052, 45051, 46039, 47276, 47678, 47716, 51014, 54408, 54596, 56853, 61851, 62016, 62461, 68257, 69793, 73976, 73999, 74053, 75315, 75729, 76466, 77216, 77217, 79239, 80825, 81060, 81097, 81426, 84787, 84896, 85165, 86502, 86753, 86941, 88787 and 95598. Polymorphic variants at the following positions in SEQ ID NO: 6 in particular were associated with an increased risk of osteoarthritis: 47716 and 69793. In particular, the following polymorphic variants in SEQ ID NO: 6 were associated with risk of osteoarthritis: an adenine at position 47716 and a thymine at position 69793.

[0032] Based in part upon analyses summarized in Figures 1A-1F, a region with significant association has been identified in a locus associated with osteoarthritis. Any polymorphic variants associated with osteoarthritis in a region of significant association can be utilized for embodiments described herein. For example, polymorphic variants in a region spanning positions 21233000 to 21243000 (approximately 10,000 nucleotides in length) in a *APOB* locus, a region spanning chromosome positions 102456500 to 102471500 (approximately 15,000 nucleotides in length) in a *IL1RL2* locus, a region spanning chromosome positions 175647734 to 175655734 (approximately 8,000 nucleotides in length) in a *WASPIP* locus, a region spanning chromosome positions 105595000 to 105615000 (approximately 20,000 nucleotides in length) in a *BVES* locus, a region spanning chromosome positions 71957600 to 71962600 (approximately 5,000 nucleotides in length) in a *LOXLI* locus and a region spanning chromosome positions 76221000 to 76226000 (approximately 5,000 nucleotides in length) in a *CASPR4* locus, have significant association (chromosome positions are within NCBI's Genome build 34).

Additional Polymorphic Variants Associated with Osteoarthritis

[0033] Also provided is a method for identifying polymorphic variants proximal to an incident, founder polymorphic variant associated with osteoarthritis. Thus, featured herein are methods for identifying a polymorphic variation associated with osteoarthritis that is proximal to an incident polymorphic variation associated with osteoarthritis, which comprises identifying a polymorphic variant proximal to the incident polymorphic variant associated with osteoarthritis, where the incident polymorphic variant is in a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence. The nucleotide sequence often comprises a polynucleotide sequence selected from the group consisting of (a) a polynucleotide sequence of SEQ ID NO: 1-17; (b) a polynucleotide sequence that encodes a polypeptide having an amino acid sequence encoded by a polynucleotide sequence of SEQ ID NO: 1-17; and (c) a polynucleotide sequence that encodes a polypeptide having an amino acid sequence that is 90% or more identical to an amino acid sequence encoded by a nucleotide

sequence of SEQ ID NO: 1-17 or a polynucleotide sequence 90% or more identical to the polynucleotide sequence of SEQ ID NO: 1-17. The presence or absence of an association of the proximal polymorphic variant with osteoarthritis then is determined using a known association method, such as a method described in the Examples hereafter. In an embodiment, the incident polymorphic variant is a polymorphic variant associated with osteoarthritis described herein. In another embodiment, the proximal polymorphic variant identified sometimes is a publicly disclosed polymorphic variant, which for example, sometimes is published in a publicly available database. In other embodiments, the polymorphic variant identified is not publicly disclosed and is discovered using a known method, including, but not limited to, sequencing a region surrounding the incident polymorphic variant in a group of nucleic samples. Thus, multiple polymorphic variants proximal to an incident polymorphic variant are associated with osteoarthritis using this method.

[0034] The proximal polymorphic variant often is identified in a region surrounding the incident polymorphic variant. In certain embodiments, this surrounding region is about 50 kb flanking the first polymorphic variant (e.g. about 50 kb 5' of the first polymorphic variant and about 50 kb 3' of the first polymorphic variant), and the region sometimes is composed of shorter flanking sequences, such as flanking sequences of about 40 kb, about 30 kb, about 25 kb, about 20 kb, about 15 kb, about 10 kb, about 7 kb, about 5 kb, or about 2 kb 5' and 3' of the incident polymorphic variant. In other embodiments, the region is composed of longer flanking sequences, such as flanking sequences of about 55 kb, about 60 kb, about 65 kb, about 70 kb, about 75 kb, about 80 kb, about 85 kb, about 90 kb, about 95 kb, or about 100 kb 5' and 3' of the incident polymorphic variant.

[0035] In certain embodiments, polymorphic variants associated with osteoarthritis are identified iteratively. For example, a first proximal polymorphic variant is associated with osteoarthritis using the methods described above and then another polymorphic variant proximal to the first proximal polymorphic variant is identified (e.g., publicly disclosed or discovered) and the presence or absence of an association of one or more other polymorphic variants proximal to the first proximal polymorphic variant with osteoarthritis is determined.

[0036] The methods described herein are useful for identifying or discovering additional polymorphic variants that may be used to further characterize a gene, region or loci associated with a condition, a disease (e.g., osteoarthritis), or a disorder. For example, allelotyping or genotyping data from the additional polymorphic variants may be used to identify a functional mutation or a region of linkage disequilibrium. In certain embodiments, polymorphic variants identified or discovered within a region comprising the first polymorphic variant associated with osteoarthritis are genotyped using the genetic methods and sample selection techniques described herein, and it can be determined whether those polymorphic variants are in linkage disequilibrium with the first polymorphic variant. The size of

the region in linkage disequilibrium with the first polymorphic variant also can be assessed using these genotyping methods. Thus, provided herein are methods for determining whether a polymorphic variant is in linkage disequilibrium with a first polymorphic variant associated with osteoarthritis, and such information can be used in prognosis/diagnosis methods described herein.

Isolated Nucleic Acids

[0037] Featured herein are isolated *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid variants depicted in SEQ ID NO: 1-17, and substantially identical nucleic acids thereof. A nucleic acid variant may be represented on one or both strands in a double-stranded nucleic acid or on one chromosomal complement (heterozygous) or both chromosomal complements (homozygous).

[0038] As used herein, the term “nucleic acid” includes DNA molecules (e.g., a complementary DNA (cDNA) and genomic DNA (gDNA)) and RNA molecules (e.g., mRNA, rRNA, siRNA and tRNA) and analogs of DNA or RNA, for example, by use of nucleotide analogs. The nucleic acid molecule can be single-stranded and it is often double-stranded. The term “isolated or purified nucleic acid” refers to nucleic acids that are separated from other nucleic acids present in the natural source of the nucleic acid. For example, with regard to genomic DNA, the term “isolated” includes nucleic acids which are separated from the chromosome with which the genomic DNA is naturally associated. An “isolated” nucleic acid is often free of sequences which naturally flank the nucleic acid (i.e., sequences located at the 5' and/or 3' ends of the nucleic acid) in the genomic DNA of the organism from which the nucleic acid is derived. For example, in various embodiments, the isolated nucleic acid molecule can contain less than about 5 kb, 4 kb, 3 kb, 2 kb, 1 kb, 0.5 kb or 0.1 kb of 5' and/or 3' nucleotide sequences which flank the nucleic acid molecule in genomic DNA of the cell from which the nucleic acid is derived. Moreover, an “isolated” nucleic acid molecule, such as a cDNA molecule, can be substantially free of other cellular material, or culture medium when produced by recombinant techniques, or substantially free of chemical precursors or other chemicals when chemically synthesized. As used herein, the term “gene” refers to a nucleotide sequence that encodes a polypeptide.

[0039] Also included herein are nucleic acid fragments. These fragments often have a nucleotide sequence identical to a nucleotide sequence of SEQ ID NO: 1-17, a nucleotide sequence substantially identical to a nucleotide sequence of SEQ ID NO: 1-17, or a nucleotide sequence that is complementary to the foregoing. The nucleic acid fragment may be identical, substantially identical or homologous to a nucleotide sequence in an exon or an intron in a nucleotide sequence of SEQ ID NO: 1-17, and may encode a domain or part of a domain of a polypeptide. Sometimes, the fragment will comprises one or more of the polymorphic variations described herein as being associated with osteoarthritis. The nucleic

acid fragment is often 50, 100, or 200 or fewer base pairs in length, and is sometimes about 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 2000, 3000, 4000, 5000, 10000, 15000, or 20000 base pairs in length. A nucleic acid fragment that is complementary to a nucleotide sequence identical or substantially identical to a nucleotide sequence in SEQ ID NO: 1-17 and hybridizes to such a nucleotide sequence under stringent conditions is often referred to as a "probe." Nucleic acid fragments often include one or more polymorphic sites, or sometimes have an end that is adjacent to a polymorphic site as described hereafter.

[0040] An example of a nucleic acid fragment is an oligonucleotide. As used herein, the term "oligonucleotide" refers to a nucleic acid comprising about 8 to about 50 covalently linked nucleotides, often comprising from about 8 to about 35 nucleotides, and more often from about 10 to about 25 nucleotides. The backbone and nucleotides within an oligonucleotide may be the same as those of naturally occurring nucleic acids, or analogs or derivatives of naturally occurring nucleic acids, provided that oligonucleotides having such analogs or derivatives retain the ability to hybridize specifically to a nucleic acid comprising a targeted polymorphism. Oligonucleotides described herein may be used as hybridization probes or as components of prognostic or diagnostic assays, for example, as described herein.

[0041] Oligonucleotides are typically synthesized using standard methods and equipment, such as the ABI™3900 High Throughput DNA Synthesizer and the EXPEDITE™ 8909 Nucleic Acid Synthesizer, both of which are available from Applied Biosystems (Foster City, CA). Analogs and derivatives are exemplified in U.S. Pat. Nos. 4,469,863; 5,536,821; 5,541,306; 5,637,683; 5,637,684; 5,700,922; 5,717,083; 5,719,262; 5,739,308; 5,773,601; 5,886,165; 5,929,226; 5,977,296; 6,140,482; WO 00/56746; WO 01/14398, and related publications. Methods for synthesizing oligonucleotides comprising such analogs or derivatives are disclosed, for example, in the patent publications cited above and in U.S. Pat. Nos. 5,614,622; 5,739,314; 5,955,599; 5,962,674; 6,117,992; in WO 00/75372; and in related publications.

[0042] Oligonucleotides may also be linked to a second moiety. The second moiety may be an additional nucleotide sequence such as a tail sequence (e.g., a polyadenosine tail), an adapter sequence (e.g., phage M13 universal tail sequence), and others. Alternatively, the second moiety may be a non-nucleotide moiety such as a moiety which facilitates linkage to a solid support or a label to facilitate detection of the oligonucleotide. Such labels include, without limitation, a radioactive label, a fluorescent label, a chemiluminescent label, a paramagnetic label, and the like. The second moiety may be attached to any position of the oligonucleotide, provided the oligonucleotide can hybridize to the nucleic acid comprising the polymorphism.

Uses for Nucleic Acid Sequence

[0043] Nucleic acid coding sequences may be used for diagnostic purposes for detection and control of polypeptide expression. Also, included herein are oligonucleotide sequences such as antisense RNA, small-interfering RNA (siRNA) and DNA molecules and ribozymes that function to inhibit translation of a polypeptide. Antisense techniques and RNA interference techniques are known in the art and are described herein.

[0044] Ribozymes are enzymatic RNA molecules capable of catalyzing the specific cleavage of RNA. The mechanism of ribozyme action involves sequence specific hybridization of the ribozyme molecule to complementary target RNA, followed by endonucleolytic cleavage. For example, hammerhead motif ribozyme molecules may be engineered that specifically and efficiently catalyze endonucleolytic cleavage of RNA sequences corresponding to or complementary to *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequences. Specific ribozyme cleavage sites within any potential RNA target are initially identified by scanning the target molecule for ribozyme cleavage sites which include the following sequences, GUA, GUU and GUC. Once identified, short RNA sequences of between fifteen (15) and twenty (20) ribonucleotides corresponding to the region of the target gene containing the cleavage site may be evaluated for predicted structural features such as secondary structure that may render the oligonucleotide sequence unsuitable. The suitability of candidate targets may also be evaluated by testing their accessibility to hybridization with complementary oligonucleotides, using ribonuclease protection assays.

[0045] Antisense RNA and DNA molecules, siRNA and ribozymes may be prepared by any method known in the art for the synthesis of RNA molecules. These include techniques for chemically synthesizing oligodeoxyribonucleotides well known in the art such as solid phase phosphoramidite chemical synthesis. Alternatively, RNA molecules may be generated by *in vitro* and *in vivo* transcription of DNA sequences encoding the antisense RNA molecule. Such DNA sequences may be incorporated into a wide variety of vectors which incorporate suitable RNA polymerase promoters such as the T7 or SP6 polymerase promoters. Alternatively, antisense cDNA constructs that synthesize antisense RNA constitutively or inducibly, depending on the promoter used, can be introduced stably into cell lines.

[0046] DNA encoding a polypeptide also may have a number of uses for the diagnosis of diseases, including osteoarthritis, resulting from aberrant expression of a target gene described herein. For example, the nucleic acid sequence may be used in hybridization assays of biopsies or autopsies to diagnose abnormalities of expression or function (*e.g.*, Southern or Northern blot analysis, *in situ* hybridization assays).

[0047] In addition, the expression of a polypeptide during embryonic development may also be determined using nucleic acid encoding the polypeptide. As addressed, *infra*, production of functionally

impaired polypeptide is the cause of various disease states, such as osteoarthritis. *In situ* hybridizations using polypeptide as a probe may be employed to predict problems related to osteoarthritis. Further, as indicated, *infra*, administration of human active polypeptide, recombinantly produced as described herein, may be used to treat disease states related to functionally impaired polypeptide. Alternatively, gene therapy approaches may be employed to remedy deficiencies of functional polypeptide or to replace or compete with dysfunctional polypeptide.

Expression Vectors, Host Cells, and Genetically Engineered Cells

[0048] Provided herein are nucleic acid vectors, often expression vectors, which contain a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence, or a substantially identical sequence thereof. As used herein, the term “vector” refers to a nucleic acid molecule capable of transporting another nucleic acid to which it has been linked and can include a plasmid, cosmid, or viral vector. The vector can be capable of autonomous replication or it can integrate into a host DNA. Viral vectors may include replication defective retroviruses, adenoviruses and adeno-associated viruses for example.

[0049] A vector can include a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence in a form suitable for expression of an encoded target polypeptide or target nucleic acid in a host cell. A “target polypeptide” is a polypeptide encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence, or a substantially identical nucleotide sequence thereof. The recombinant expression vector typically includes one or more regulatory sequences operatively linked to the nucleic acid sequence to be expressed. The term “regulatory sequence” includes promoters, enhancers and other expression control elements (*e.g.*, polyadenylation signals). Regulatory sequences include those that direct constitutive expression of a nucleotide sequence, as well as tissue-specific regulatory and/or inducible sequences. The design of the expression vector can depend on such factors as the choice of the host cell to be transformed, the level of expression of polypeptide desired, and the like. Expression vectors can be introduced into host cells to produce target polypeptides, including fusion polypeptides.

[0050] Recombinant expression vectors can be designed for expression of target polypeptides in prokaryotic or eukaryotic cells. For example, target polypeptides can be expressed in *E. coli*, insect cells (*e.g.*, using baculovirus expression vectors), yeast cells, or mammalian cells. Suitable host cells are discussed further in Goeddel, *Gene Expression Technology: Methods in Enzymology 185*, Academic Press, San Diego, CA (1990). Alternatively, the recombinant expression vector can be transcribed and translated *in vitro*, for example using T7 promoter regulatory sequences and T7 polymerase.

[0051] Expression of polypeptides in prokaryotes is most often carried out in *E. coli* with vectors containing constitutive or inducible promoters directing the expression of either fusion or non-fusion polypeptides. Fusion vectors add a number of amino acids to a polypeptide encoded therein, usually to the amino terminus of the recombinant polypeptide. Such fusion vectors typically serve three purposes: 1) to increase expression of recombinant polypeptide; 2) to increase the solubility of the recombinant polypeptide; and 3) to aid in the purification of the recombinant polypeptide by acting as a ligand in affinity purification. Often, a proteolytic cleavage site is introduced at the junction of the fusion moiety and the recombinant polypeptide to enable separation of the recombinant polypeptide from the fusion moiety subsequent to purification of the fusion polypeptide. Such enzymes, and their cognate recognition sequences, include Factor Xa, thrombin and enterokinase. Typical fusion expression vectors include pGEX (Pharmacia Biotech Inc; Smith & Johnson, *Gene* 67: 31-40 (1988)), pMAL (New England Biolabs, Beverly, MA) and pRIT5 (Pharmacia, Piscataway, NJ) which fuse glutathione S-transferase (GST), maltose E binding polypeptide, or polypeptide A, respectively, to the target recombinant polypeptide.

[0052] Purified fusion polypeptides can be used in screening assays and to generate antibodies specific for target polypeptides. In a therapeutic embodiment, fusion polypeptide expressed in a retroviral expression vector is used to infect bone marrow cells that are subsequently transplanted into irradiated recipients. The pathology of the subject recipient is then examined after sufficient time has passed (e.g., six (6) weeks).

[0053] Expressing the polypeptide in host bacteria with an impaired capacity to proteolytically cleave the recombinant polypeptide is often used to maximize recombinant polypeptide expression (Gottesman, S., *Gene Expression Technology: Methods in Enzymology*, Academic Press, San Diego, California 185: 119-128 (1990)). Another strategy is to alter the nucleotide sequence of the nucleic acid to be inserted into an expression vector so that the individual codons for each amino acid are those preferentially utilized in *E. coli* (Wada *et al.*, *Nucleic Acids Res.* 20: 2111-2118 (1992)). Such alteration of nucleotide sequences can be carried out by standard DNA synthesis techniques.

[0054] When used in mammalian cells, the expression vector's control functions are often provided by viral regulatory elements. For example, commonly used promoters are derived from polyoma, Adenovirus 2, cytomegalovirus and Simian Virus 40. Recombinant mammalian expression vectors are often capable of directing expression of the nucleic acid in a particular cell type (e.g., tissue-specific regulatory elements are used to express the nucleic acid). Non-limiting examples of suitable tissue-specific promoters include an albumin promoter (liver-specific; Pinkert *et al.*, *Genes Dev.* 1: 268-277 (1987)), lymphoid-specific promoters (Calame & Eaton, *Adv. Immunol.* 43: 235-275 (1988)), promoters of T cell receptors (Winoto & Baltimore, *EMBO J.* 8: 729-733 (1989)) promoters of immunoglobulins

(Banerji *et al.*, *Cell* 33: 729-740 (1983); Queen & Baltimore, *Cell* 33: 741-748 (1983)), neuron-specific promoters (e.g., the neurofilament promoter; Byrne & Ruddle, *Proc. Natl. Acad. Sci. USA* 86: 5473-5477 (1989)), pancreas-specific promoters (Edlund *et al.*, *Science* 230: 912-916 (1985)), and mammary gland-specific promoters (e.g., milk whey promoter; U.S. Patent No. 4,873,316 and European Application Publication No. 264,166). Developmentally-regulated promoters are sometimes utilized, for example, the murine hox promoters (Kessel & Gruss, *Science* 249: 374-379 (1990)) and the α -fetoprotein promoter (Campes & Tilghman, *Genes Dev.* 3: 537-546 (1989)).

[0055] A *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid also may be cloned into an expression vector in an antisense orientation. Regulatory sequences (e.g., viral promoters and/or enhancers) operatively linked to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid cloned in the antisense orientation can be chosen for directing constitutive, tissue specific or cell type specific expression of antisense RNA in a variety of cell types. Antisense expression vectors can be in the form of a recombinant plasmid, phagemid or attenuated virus. For a discussion of the regulation of gene expression using antisense genes see, e.g., Weintraub *et al.*, Antisense RNA as a molecular tool for genetic analysis, *Reviews - Trends in Genetics*, Vol. 1(1) (1986).

[0056] Also provided herein are host cells that include a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence within a recombinant expression vector or a fragment of such a nucleotide sequence which facilitate homologous recombination into a specific site of the host cell genome. The terms "host cell" and "recombinant host cell" are used interchangeably herein. Such terms refer not only to the particular subject cell but rather also to the progeny or potential progeny of such a cell. Because certain modifications may occur in succeeding generations due to either mutation or environmental influences, such progeny may not, in fact, be identical to the parent cell, but are still included within the scope of the term as used herein. A host cell can be any prokaryotic or eukaryotic cell. For example, a target polypeptide can be expressed in bacterial cells such as *E. coli*, insect cells, yeast or mammalian cells (such as Chinese hamster ovary cells (CHO) or COS cells). Other suitable host cells are known to those skilled in the art.

[0057] Vectors can be introduced into host cells via conventional transformation or transfection techniques. As used herein, the terms "transformation" and "transfection" are intended to refer to a variety of art-recognized techniques for introducing foreign nucleic acid (e.g., DNA) into a host cell, including calcium phosphate or calcium chloride co-precipitation, transduction/infection, DEAE-dextran-mediated transfection, lipofection, or electroporation.

[0058] A host cell provided herein can be used to produce (*i.e.*, express) a target polypeptide or a substantially identical polypeptide thereof. Accordingly, further provided are methods for producing a

target polypeptide using host cells described herein. In one embodiment, the method includes culturing host cells into which a recombinant expression vector encoding a target polypeptide has been introduced in a suitable medium such that a target polypeptide is produced. In another embodiment, the method further includes isolating a target polypeptide from the medium or the host cell.

[0059] Also provided are cells or purified preparations of cells which include a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* transgene, or which otherwise misexpress target polypeptide. Cell preparations can consist of human or non-human cells, e.g., rodent cells, e.g., mouse or rat cells, rabbit cells, or pig cells. In preferred embodiments, the cell or cells include a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* transgene (e.g., a heterologous form of a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* gene, such as a human gene expressed in non-human cells). The transgene can be misexpressed, e.g., overexpressed or underexpressed. In other preferred embodiments, the cell or cells include a gene which misexpress an endogenous target polypeptide (e.g., expression of a gene is disrupted, also known as a knockout). Such cells can serve as a model for studying disorders which are related to mutated or mis-expressed alleles or for use in drug screening. Also provided are human cells (e.g., a hematopoietic stem cells) transfected with a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid.

[0060] Also provided are cells or a purified preparation thereof (e.g., human cells) in which an endogenous *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid is under the control of a regulatory sequence that does not normally control the expression of the endogenous gene. The expression characteristics of an endogenous gene within a cell (e.g., a cell line or microorganism) can be modified by inserting a heterologous DNA regulatory element into the genome of the cell such that the inserted regulatory element is operably linked to the corresponding endogenous gene. For example, an endogenous corresponding gene (e.g., a gene which is "transcriptionally silent," not normally expressed, or expressed only at very low levels) may be activated by inserting a regulatory element which is capable of promoting the expression of a normally expressed gene product in that cell. Techniques such as targeted homologous recombinations, can be used to insert the heterologous DNA as described in, e.g., Chappell, US 5,272,071; WO 91/06667, published on May 16, 1991.

Transgenic Animals

[0061] Non-human transgenic animals that express a heterologous target polypeptide (e.g., expressed from a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid or substantially identical sequence thereof) can be generated. Such animals are useful for studying the function and/or activity of a target polypeptide and for identifying and/or evaluating modulators of the activity of *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic

acids and encoded polypeptides. As used herein, a “transgenic animal” is a non-human animal such as a mammal (*e.g.*, a non-human primate such as chimpanzee, baboon, or macaque; an ungulate such as an equine, bovine, or caprine; or a rodent such as a rat, a mouse, or an Israeli sand rat), a bird (*e.g.*, a chicken or a turkey), an amphibian (*e.g.*, a frog, salamander, or newt), or an insect (*e.g.*, *Drosophila melanogaster*), in which one or more of the cells of the animal includes a transgene. A transgene is exogenous DNA or a rearrangement (*e.g.*, a deletion of endogenous chromosomal DNA) that is often integrated into or occurs in the genome of cells in a transgenic animal. A transgene can direct expression of an encoded gene product in one or more cell types or tissues of the transgenic animal, and other transgenes can reduce expression (*e.g.*, a knockout). Thus, a transgenic animal can be one in which an endogenous nucleic acid homologous to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleic acid has been altered by homologous recombination between the endogenous gene and an exogenous DNA molecule introduced into a cell of the animal (*e.g.*, an embryonic cell of the animal) prior to development of the animal.

[0062] Intronic sequences and polyadenylation signals can also be included in the transgene to increase expression efficiency of the transgene. One or more tissue-specific regulatory sequences can be operably linked to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence to direct expression of an encoded polypeptide to particular cells. A transgenic founder animal can be identified based upon the presence of a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence in its genome and/or expression of encoded mRNA in tissues or cells of the animals. A transgenic founder animal can then be used to breed additional animals carrying the transgene. Moreover, transgenic animals carrying a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence can further be bred to other transgenic animals carrying other transgenes.

[0063] Target polypeptides can be expressed in transgenic animals or plants by introducing, for example, a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleic acid into the genome of an animal that encodes the target polypeptide. In preferred embodiments the nucleic acid is placed under the control of a tissue specific promoter, *e.g.*, a milk or egg specific promoter, and recovered from the milk or eggs produced by the animal. Also included is a population of cells from a transgenic animal.

Target Polypeptides

[0064] Also featured herein are isolated target polypeptides, which are encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence (*e.g.*, SEQ ID NO: 1), or a substantially identical nucleotide sequence thereof. Examples of *PADI2*, *APOB*, *IL1RL2*, *WASPIP*,

BVES, *PELI2*, *LOXLI1*, *CASPR4* or *GPR50* polypeptides are set forth in SEQ ID NO: 18-27. The term “polypeptide” as used herein includes proteins and peptides. An “isolated” or “purified” polypeptide or protein is substantially free of cellular material or other contaminating proteins from the cell or tissue source from which the protein is derived, or substantially free from chemical precursors or other chemicals when chemically synthesized. In one embodiment, the language “substantially free” means preparation of a target polypeptide having less than about 30%, 20%, 10% and more preferably 5% (by dry weight), of non-target polypeptide (also referred to herein as a “contaminating protein”), or of chemical precursors or non-target chemicals. When the target polypeptide or a biologically active portion thereof is recombinantly produced, it is also preferably substantially free of culture medium, specifically, where culture medium represents less than about 20%, sometimes less than about 10%, and often less than about 5% of the volume of the polypeptide preparation. Isolated or purified target polypeptide preparations are sometimes 0.01 milligrams or more or 0.1 milligrams or more, and often 1.0 milligrams or more and 10 milligrams or more in dry weight.

[0065] Further included herein are target polypeptide fragments. The polypeptide fragment may be a domain or part of a domain of a target polypeptide. The polypeptide fragment may have increased, decreased or unexpected biological activity. The polypeptide fragment is often 50 or fewer, 100 or fewer, or 200 or fewer amino acids in length, and is sometimes 300, 400, 500, 600, 700, or 900 or fewer amino acids in length. Shown in the table below are examples of polypeptide fragments, where approximate amino acid positions are shown in parenthesis (e.g., a Pellino domain starts at about amino acid 3 and ends at about amino acid 412).

RS_ID	Locus	SEQ ID NO.	Signal Peptide	Domain
910223	PADI2	18	none	
1367117	APOB	19	1-27	Apolipoprotein B48 mature peptide (1-2151) Lipoprotein amino terminal region (46-597) ATPase involved in DNA repair (2077-2583)
1024791	IL1RL2	20	1-19	Immunoglobulin C-2 Type (36-100; 137-197) TIR Domain (385-535) Neural cell adhesion molecule L1 (<53->295) Transmembrane Domain (336-358)
1465621	WASPIP	21	none	WASP-interacting protein VRP1/WIP

RS_ID	Locus	SEQ ID NO.	Signal Peptide	Domain
				(14-63)
1018810	BVES	22	none	Popeye protein conserved region (123-266)
242392	PELI2	23	none	Pellino (3-412)
8818	LOXL1	24	none	Lysyl oxidase (370-574)
1395486	CASPR4	25	none	Neurexin IV domain (3-1308) F5/8 type C domain (57-177) Laminin G domains (374-524; 475-750; 797-941; 1037-1176)
		26	none	Neurexin IV domain (1-721) F5/8 type C domain (29-149) Laminin G domains (169-314; 346-496; 579-662)
512294	GPR50	27	none	7 transmembrane receptor (rhodopsin family) (45..294) Microtubule-associated protein dynactin DCTN1/Glued (462..>587) Syndecan domain (485..>595)

[0066] Substantially identical target polypeptides may depart from the amino acid sequences of target polypeptides in different manners. For example, conservative amino acid modifications may be introduced at one or more positions in the amino acid sequences of target polypeptides. A “conservative amino acid substitution” is one in which the amino acid is replaced by another amino acid having a similar structure and/or chemical function. Families of amino acid residues having similar structures and functions are well known. These families include amino acids with basic side chains (*e.g.*, lysine, arginine, histidine), acidic side chains (*e.g.*, aspartic acid, glutamic acid), uncharged polar side chains (*e.g.*, glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (*e.g.*, alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (*e.g.*, threonine, valine, isoleucine) and aromatic side chains (*e.g.*, tyrosine, phenylalanine, tryptophan, histidine). Also, essential and non-essential amino acids may be replaced. A “non-essential” amino acid is one that can be altered without abolishing or substantially altering the biological function of a target polypeptide, whereas altering an “essential” amino acid abolishes or substantially alters the biological function of a target polypeptide. Amino acids that are conserved among target polypeptides are typically essential amino acids. In certain embodiments, the polypeptide includes one or more non-

synonymous polymorphic variants associated with osteoarthritis, as described above (e.g., a threonine encoded by rs1367117 in an *APOB* polypeptide).

[0067] Also, target polypeptides may exist as chimeric or fusion polypeptides. As used herein, a target “chimeric polypeptide” or target “fusion polypeptide” includes a target polypeptide linked to a non-target polypeptide. A “non-target polypeptide” refers to a polypeptide having an amino acid sequence corresponding to a polypeptide which is not substantially identical to the target polypeptide, which includes, for example, a polypeptide that is different from the target polypeptide and derived from the same or a different organism. The target polypeptide in the fusion polypeptide can correspond to an entire or nearly entire target polypeptide or a fragment thereof. The non-target polypeptide can be fused to the N-terminus or C-terminus of the target polypeptide.

[0068] Fusion polypeptides can include a moiety having high affinity for a ligand. For example, the fusion polypeptide can be a GST-target fusion polypeptide in which the target sequences are fused to the C-terminus of the GST sequences, or a polyhistidine-target fusion polypeptide in which the target polypeptide is fused at the N- or C-terminus to a string of histidine residues. Such fusion polypeptides can facilitate purification of recombinant target polypeptide. Expression vectors are commercially available that already encode a fusion moiety (e.g., a GST polypeptide), and a nucleotide sequence in SEQ ID NO: 1-17, or a substantially identical nucleotide sequence thereof, can be cloned into an expression vector such that the fusion moiety is linked in-frame to the target polypeptide. Further, the fusion polypeptide can be a target polypeptide containing a heterologous signal sequence at its N-terminus. In certain host cells (e.g., mammalian host cells), expression, secretion, cellular internalization, and cellular localization of a target polypeptide can be increased through use of a heterologous signal sequence. Fusion polypeptides can also include all or a part of a serum polypeptide (e.g., an IgG constant region or human serum albumin).

[0069] Target polypeptides can be incorporated into pharmaceutical compositions and administered to a subject *in vivo*. Administration of these target polypeptides can be used to affect the bioavailability of a substrate of the target polypeptide and may effectively increase target polypeptide biological activity in a cell. Target fusion polypeptides may be useful therapeutically for the treatment of disorders caused by, for example, (i) aberrant modification or mutation of a gene encoding a target polypeptide; (ii) misregulation of the gene encoding the target polypeptide; and (iii) aberrant post-translational modification of a target polypeptide. Also, target polypeptides can be used as immunogens to produce anti-target antibodies in a subject, to purify target polypeptide ligands or binding partners, and in screening assays to identify molecules which inhibit or enhance the interaction of a target polypeptide with a substrate.

[0070] In addition, polypeptides can be chemically synthesized using techniques known in the art (See, e.g., Creighton, 1983 *Proteins*. New York, N.Y.: W. H. Freeman and Company; and Hunkapiller et

al., (1984) Nature July 12 -18;310(5973):105-11). For example, a relative short fragment can be synthesized by use of a peptide synthesizer. Furthermore, if desired, non-classical amino acids or chemical amino acid analogs can be introduced as a substitution or addition into the fragment sequence. Non-classical amino acids include, but are not limited to, to the D-isomers of the common amino acids, 2,4-diaminobutyric acid, a-amino isobutyric acid, 4-aminobutyric acid, Abu, 2-amino butyric acid, g-Abu, e-Ahx, 6-amino hexanoic acid, Aib, 2-amino isobutyric acid, 3-amino propionic acid, ornithine, norleucine, norvaline, hydroxyproline, sarcosine, citrulline, homocitrulline, cysteic acid, t-butylglycine, t-butylalanine, phenylglycine, cyclohexylalanine, b-alanine, fluoroamino acids, designer amino acids such as b-methyl amino acids, Ca-methyl amino acids, Na-methyl amino acids, and amino acid analogs in general. Furthermore, the amino acid can be D (dextrorotary) or L (levorotary).

[0071] Polypeptides and polypeptide fragments sometimes are differentially modified during or after translation, e.g., by glycosylation, acetylation, phosphorylation, amidation, derivatization by known protecting/blocking groups, proteolytic cleavage, linkage to an antibody molecule or other cellular ligand, etc. Any of numerous chemical modifications may be carried out by known techniques, including but not limited, to specific chemical cleavage by cyanogen bromide, trypsin, chymotrypsin, papain, V8 protease, NaBH₄; acetylation, formylation, oxidation, reduction; metabolic synthesis in the presence of tunicamycin; and the like. Additional post-translational modifications include, for example, N-linked or O-linked carbohydrate chains, processing of N-terminal or C-terminal ends), attachment of chemical moieties to the amino acid backbone, chemical modifications of N-linked or O-linked carbohydrate chains, and addition or deletion of an N-terminal methionine residue as a result of prokaryotic host cell expression. The polypeptide fragments may also be modified with a detectable label, such as an enzymatic, fluorescent, isotopic or affinity label to allow for detection and isolation of the polypeptide.

[0072] Also provided are chemically modified derivatives of polypeptides that can provide additional advantages such as increased solubility, stability and circulating time of the polypeptide, or decreased immunogenicity (*see e.g.*, U.S. Pat. No. 4,179,337. The chemical moieties for derivitization may be selected from water soluble polymers such as polyethylene glycol, ethylene glycol/propylene glycol copolymers, carboxymethylcellulose, dextran, polyvinyl alcohol and the like. The polypeptides may be modified at random positions within the molecule, or at predetermined positions within the molecule and may include one, two, three or more attached chemical moieties.

[0073] The polymer may be of any molecular weight, and may be branched or unbranched. For polyethylene glycol, the preferred molecular weight is between about 1 kDa and about 100 kDa (the term "about" indicating that in preparations of polyethylene glycol, some molecules will weigh more, some less, than the stated molecular weight) for ease in handling and manufacturing. Other sizes may be used, depending on the desired therapeutic profile (e.g., the duration of sustained release desired, the effects, if

any on biological activity, the ease in handling, the degree or lack of antigenicity and other known effects of the polyethylene glycol to a therapeutic protein or analog).

[0074] The polymers should be attached to the polypeptide with consideration of effects on functional or antigenic domains of the polypeptide. There are a number of attachment methods available to those skilled in the art (e.g., EP 0 401 384 (coupling PEG to G-CSF) and Malik et al. (1992) Exp Hematol. September;20(8):1028-35 (pegylation of GM-CSF using tresyl chloride)). For example, polyethylene glycol may be covalently bound through amino acid residues via a reactive group, such as a free amino or carboxyl group. Reactive groups are those to which an activated polyethylene glycol molecule may be bound. The amino acid residues having a free amino group may include lysine residues and the N-terminal amino acid residues; those having a free carboxyl group may include aspartic acid residues, glutamic acid residues and the C-terminal amino acid residue. Sulfhydryl groups may also be used as a reactive group for attaching the polyethylene glycol molecules. For therapeutic purposes, the attachment sometimes is at an amino group, such as attachment at the N-terminus or lysine group.

[0075] Proteins can be chemically modified at the N-terminus. Using polyethylene glycol as an illustration of such a composition, one may select from a variety of polyethylene glycol molecules (by molecular weight, branching, and the like), the proportion of polyethylene glycol molecules to protein (polypeptide) molecules in the reaction mix, the type of pegylation reaction to be performed, and the method of obtaining the selected N-terminally pegylated protein. The method of obtaining the N-terminally pegylated preparation (i.e., separating this moiety from other monopegylated moieties if necessary) may be by purification of the N-terminally pegylated material from a population of pegylated protein molecules. Selective proteins chemically modified at the N-terminus may be accomplished by reductive alkylation, which exploits differential reactivity of different types of primary amino groups (lysine versus the N-terminal) available for derivatization in a particular protein. Under the appropriate reaction conditions, substantially selective derivatization of the protein at the N-terminus with a carbonyl group containing polymer is achieved.

Substantially Identical Nucleic Acids and Polypeptides

[0076] Nucleotide sequences and polypeptide sequences that are substantially identical to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence and the target polypeptide sequences encoded by those nucleotide sequences, respectively, are included herein. The term "substantially identical" as used herein refers to two or more nucleic acids or polypeptides sharing one or more identical nucleotide sequences or polypeptide sequences, respectively. Included are nucleotide sequences or polypeptide sequences that are 55% or more, 60% or more, 65% or more, 70% or more, 75% or more, 80% or more, 85% or more, 90% or more, 95% or more (each often within a 1%,

2%, 3% or 4% variability) identical to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI1*, *CASPR4* or *GPR50* nucleotide sequence or the encoded target polypeptide amino acid sequences. One test for determining whether two nucleic acids are substantially identical is to determine the percent of identical nucleotide sequences or polypeptide sequences shared between the nucleic acids or polypeptides.

[0077] Calculations of sequence identity are often performed as follows. Sequences are aligned for optimal comparison purposes (*e.g.*, gaps can be introduced in one or both of a first and a second amino acid or nucleic acid sequence for optimal alignment and non-homologous sequences can be disregarded for comparison purposes). The length of a reference sequence aligned for comparison purposes is sometimes 30% or more, 40% or more, 50% or more, often 60% or more, and more often 70% or more, 80% or more, 90% or more, or 100% of the length of the reference sequence. The nucleotides or amino acids at corresponding nucleotide or polypeptide positions, respectively, are then compared among the two sequences. When a position in the first sequence is occupied by the same nucleotide or amino acid as the corresponding position in the second sequence, the nucleotides or amino acids are deemed to be identical at that position. The percent identity between the two sequences is a function of the number of identical positions shared by the sequences, taking into account the number of gaps, and the length of each gap, introduced for optimal alignment of the two sequences.

[0078] Comparison of sequences and determination of percent identity between two sequences can be accomplished using a mathematical algorithm. Percent identity between two amino acid or nucleotide sequences can be determined using the algorithm of Meyers & Miller, *CABIOS* 4: 11-17 (1989), which has been incorporated into the ALIGN program (version 2.0), using a PAM120 weight residue table, a gap length penalty of 12 and a gap penalty of 4. Also, percent identity between two amino acid sequences can be determined using the Needleman & Wunsch, *J. Mol. Biol.* 48: 444-453 (1970) algorithm which has been incorporated into the GAP program in the GCG software package (available at the http address www.gcg.com), using either a Blossum 62 matrix or a PAM250 matrix, and a gap weight of 16, 14, 12, 10, 8, 6, or 4 and a length weight of 1, 2, 3, 4, 5, or 6. Percent identity between two nucleotide sequences can be determined using the GAP program in the GCG software package (available at http address www.gcg.com), using a NWSgapdna.CMP matrix and a gap weight of 40, 50, 60, 70, or 80 and a length weight of 1, 2, 3, 4, 5, or 6. A set of parameters often used is a Blossum 62 scoring matrix with a gap open penalty of 12, a gap extend penalty of 4, and a frameshift gap penalty of 5.

[0079] Another manner for determining if two nucleic acids are substantially identical is to assess whether a polynucleotide homologous to one nucleic acid will hybridize to the other nucleic acid under stringent conditions. As use herein, the term "stringent conditions" refers to conditions for hybridization and washing. Stringent conditions are known to those skilled in the art and can be found in *Current*

Protocols in Molecular Biology, John Wiley & Sons, N.Y. , 6.3.1-6.3.6 (1989). Aqueous and non-aqueous methods are described in that reference and either can be used. An example of stringent hybridization conditions is hybridization in 6X sodium chloride/sodium citrate (SSC) at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 50°C. Another example of stringent hybridization conditions are hybridization in 6X sodium chloride/sodium citrate (SSC) at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 55°C. A further example of stringent hybridization conditions is hybridization in 6X sodium chloride/sodium citrate (SSC) at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 60°C. Often, stringent hybridization conditions are hybridization in 6X sodium chloride/sodium citrate (SSC) at about 45°C, followed by one or more washes in 0.2X SSC, 0.1% SDS at 65°C. More often, stringency conditions are 0.5M sodium phosphate, 7% SDS at 65°C, followed by one or more washes at 0.2X SSC, 1% SDS at 65°C.

[0080] An example of a substantially identical nucleotide sequence to a nucleotide sequence in SEQ ID NO: 1-17 is one that has a different nucleotide sequence but still encodes the same polypeptide sequence encoded by the nucleotide sequence in SEQ ID NO: 1-17. Another example is a nucleotide sequence that encodes a polypeptide having a polypeptide sequence that is more than 70% or more identical to, sometimes more than 75% or more, 80% or more, or 85% or more identical to, and often more than 90% or more and 95% or more identical to a polypeptide sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17.

[0081] Nucleotide sequences in SEQ ID NO: 1-17 and amino acid sequences of encoded polypeptides can be used as "query sequences" to perform a search against public databases to identify other family members or related sequences, for example. Such searches can be performed using the NBLAST and XBLAST programs (version 2.0) of Altschul *et al.*, *J. Mol. Biol.* 215: 403-10 (1990). BLAST nucleotide searches can be performed with the NBLAST program, score = 100, wordlength = 12 to obtain nucleotide sequences homologous to nucleotide sequences in SEQ ID NO: 1-17. BLAST polypeptide searches can be performed with the XBLAST program, score = 50, wordlength = 3 to obtain amino acid sequences homologous to polypeptides encoded by the nucleotide sequences of SEQ ID NO: 1-17. To obtain gapped alignments for comparison purposes, Gapped BLAST can be utilized as described in Altschul *et al.*, *Nucleic Acids Res.* 25(17): 3389-3402 (1997). When utilizing BLAST and Gapped BLAST programs, default parameters of the respective programs (*e.g.*, XBLAST and NBLAST) can be used (*see* the http address www.ncbi.nlm.nih.gov).

[0082] A nucleic acid that is substantially identical to a nucleotide sequence in SEQ ID NO: 1-17 may include polymorphic sites at positions equivalent to those described herein when the sequences are aligned. For example, using the alignment procedures described herein, SNPs in a sequence substantially

identical to a sequence in SEQ ID NO: 1-17 can be identified at nucleotide positions that match (*i.e.*, align) with nucleotides at SNP positions in each nucleotide sequence in SEQ ID NO: 1-17. Also, where a polymorphic variation results in an insertion or deletion, insertion or deletion of a nucleotide sequence from a reference sequence can change the relative positions of other polymorphic sites in the nucleotide sequence.

[0083] Substantially identical nucleotide and polypeptide sequences include those that are naturally occurring, such as allelic variants (same locus), splice variants, homologs (different locus), and orthologs (different organism) or can be non-naturally occurring. Non-naturally occurring variants can be generated by mutagenesis techniques, including those applied to polynucleotides, cells, or organisms. The variants can contain nucleotide substitutions, deletions, inversions and insertions. Variation can occur in either or both the coding and non-coding regions. The variations can produce both conservative and non-conservative amino acid substitutions (as compared in the encoded product). Orthologs, homologs, allelic variants, and splice variants can be identified using methods known in the art. These variants normally comprise a nucleotide sequence encoding a polypeptide that is 50% or more, about 55% or more, often about 70-75% or more or about 80-85% or more, and sometimes about 90-95% or more identical to the amino acid sequences of target polypeptides or a fragment thereof. Such nucleic acid molecules can readily be identified as being able to hybridize under stringent conditions to a nucleotide sequence in SEQ ID NO: 1-17 or a fragment of this sequence. Nucleic acid molecules corresponding to orthologs, homologs, and allelic variants of a nucleotide sequence in SEQ ID NO: 1-17 can further be identified by mapping the sequence to the same chromosome or locus as the nucleotide sequence in SEQ ID NO: 1-17.

[0084] Also, substantially identical nucleotide sequences may include codons that are altered with respect to the naturally occurring sequence for enhancing expression of a target polypeptide in a particular expression system. For example, the nucleic acid can be one in which one or more codons are altered, and often 10% or more or 20% or more of the codons are altered for optimized expression in bacteria (*e.g.*, *E. coli*), yeast (*e.g.*, *S. cerevisiae*), human (*e.g.*, 293 cells), insect, or rodent (*e.g.*, hamster) cells.

Methods for Identifying Risk of osteoarthritis

[0085] Methods for prognosing and diagnosing osteoarthritis are included herein. These methods include detecting the presence or absence of one or more polymorphic variations in a nucleotide sequence associated with osteoarthritis, such as variants in or around the loci set forth herein, or a substantially identical sequence thereof, in a sample from a subject, where the presence of a polymorphic variant described herein is indicative of a risk of osteoarthritis. Determining a risk of osteoarthritis sometimes

refers to determining whether an individual is at an increased risk of osteoarthritis (e.g., intermediate risk or higher risk).

[0086] Thus, featured herein is a method for identifying a subject who is at risk of osteoarthritis, which comprises detecting an aberration associated with osteoarthritis in a nucleic acid sample from the subject. An embodiment is a method for detecting a risk of osteoarthritis in a subject, which comprises detecting the presence or absence of a polymorphic variation associated with osteoarthritis at a polymorphic site in a nucleotide sequence in a nucleic acid sample from a subject, where the nucleotide sequence comprises a polynucleotide sequence selected from the group consisting of: (a) a nucleotide sequence of SEQ ID NO: 1-17; (b) a nucleotide sequence which encodes a polypeptide consisting of an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17; (c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17, or a nucleotide sequence about 90% or more identical to a nucleotide sequence of SEQ ID NO: 1-17; and (d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising the polymorphic site; whereby the presence of the polymorphic variation is indicative of a predisposition to osteoarthritis in the subject. In certain embodiments, polymorphic variants at the positions described herein are detected for determining a risk of osteoarthritis, and polymorphic variants at positions in linkage disequilibrium with these positions are detected for determining a risk of osteoarthritis. As used herein, "SEQ ID NO: 1-17" refers to individual sequences in SEQ ID NO: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17, each sequence being separately applicable to embodiments described herein.

[0087] Risk of osteoarthritis sometimes is expressed as a probability, such as an odds ratio, percentage, or risk factor. Risk often is based upon the presence or absence of one or more polymorphic variants described herein, and also may be based in part upon phenotypic traits of the individual being tested. Methods for calculating risk based upon patient data are well known (*see, e.g., Agresti, Categorical Data Analysis*, 2nd Ed. 2002. Wiley). Allelotyping and genotyping analyses may be carried out in populations other than those exemplified herein to enhance the predictive power of the prognostic method. These further analyses are executed in view of the exemplified procedures described herein, and may be based upon the same polymorphic variations or additional polymorphic variations.

[0088] In certain embodiments, determining the presence of a combination of two or more polymorphic variants associated with osteoarthritis in one or more genetic loci (e.g., one or more genes) of the sample is determined to identify, quantify and/or estimate, risk of osteoarthritis. The risk often is the probability of having or developing osteoarthritis. The risk sometimes is expressed as a relative risk with respect to a population average risk of osteoarthritis, and sometimes is expressed as a relative risk with respect to the lowest risk group. Such relative risk assessments often are based upon penetrance

values determined by statistical methods, and are particularly useful to clinicians and insurance companies for assessing risk of osteoarthritis (e.g., a clinician can target appropriate detection, prevention and therapeutic regimens to a patient after determining the patient's risk of osteoarthritis, and an insurance company can fine tune actuarial tables based upon population genotype assessments of osteoarthritis risk). Risk of osteoarthritis sometimes is expressed as an odds ratio, which is the odds of a particular person having a genotype has or will develop osteoarthritis with respect to another genotype group (e.g., the most disease protective genotype or population average). In related embodiments, the determination is utilized to identify a subject at risk of osteoarthritis. In an embodiment, two or more polymorphic variations are detected in two or more regions in human genomic DNA associated with increased risk of osteoarthritis, such as a locus containing a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* region, for example. In certain embodiments, 3 or more, or 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 or more polymorphic variants are detected in the sample. In specific embodiments, polymorphic variants are detected in a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* region, for example. In another embodiment, polymorphic variants are detected at two or three positions selected from the group consisting of position 52511 in SEQ ID NO: 2 and positions 30900, 76512 and/or 94155 in SEQ ID NO: 3. In certain embodiments, polymorphic variants are detected at other genetic loci (e.g., the polymorphic variants can be detected in *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* in addition to other loci or only in other loci), where the other loci include but are not limited to those described in concurrently-filed patent applications having attorney docket number 524593008700, 524593008900, 524593009000, 524593009100 or 524593009200, each of which is incorporated herein by reference in its entirety.

[0089] Results from prognostic tests may be combined with other test results to diagnose osteoarthritis. For example, prognostic results may be gathered, a patient sample may be ordered based on a determined predisposition to osteoarthritis, the patient sample is analyzed, and the results of the analysis may be utilized to diagnose osteoarthritis. Also osteoarthritis diagnostic method can be developed from studies used to generate prognostic methods in which populations are stratified into subpopulations having different progressions of osteoarthritis. In another embodiment, prognostic results may be gathered, a patient's risk factors for developing osteoarthritis (e.g., age, weight, race, diet) analyzed, and a patient sample may be ordered based on a determined predisposition to osteoarthritis.

[0090] The nucleic acid sample typically is isolated from a biological sample obtained from a subject. For example, nucleic acid can be isolated from blood, saliva, sputum, urine, cell scrapings, and biopsy tissue. The nucleic acid sample can be isolated from a biological sample using standard techniques, such as the technique described in Example 2. As used herein, the term "subject" refers

primarily to humans but also refers to other mammals such as dogs, cats, and ungulates (*e.g.*, cattle, sheep, and swine). Subjects also include avians (*e.g.*, chickens and turkeys), reptiles, and fish (*e.g.*, salmon), as embodiments described herein can be adapted to nucleic acid samples isolated from any of these organisms. The nucleic acid sample may be isolated from the subject and then directly utilized in a method for determining the presence of a polymorphic variant, or alternatively, the sample may be isolated and then stored (*e.g.*, frozen) for a period of time before being subjected to analysis.

[0091] The presence or absence of a polymorphic variant is determined using one or both chromosomal complements represented in the nucleic acid sample. Determining the presence or absence of a polymorphic variant in both chromosomal complements represented in a nucleic acid sample from a subject having a copy of each chromosome is useful for determining the zygosity of an individual for the polymorphic variant (*i.e.*, whether the individual is homozygous or heterozygous for the polymorphic variant). Any oligonucleotide-based diagnostic may be utilized to determine whether a sample includes the presence or absence of a polymorphic variant in a sample. For example, primer extension methods, ligase sequence determination methods (*e.g.*, U.S. Pat. Nos. 5,679,524 and 5,952,174, and WO 01/27326), mismatch sequence determination methods (*e.g.*, U.S. Pat. Nos. 5,851,770; 5,958,692; 6,110,684; and 6,183,958), microarray sequence determination methods, restriction fragment length polymorphism (RFLP), single strand conformation polymorphism detection (SSCP) (*e.g.*, U.S. Pat. Nos. 5,891,625 and 6,013,499), PCR-based assays (*e.g.*, TAQMAN® PCR System (Applied Biosystems)), and nucleotide sequencing methods may be used.

[0092] Oligonucleotide extension methods typically involve providing a pair of oligonucleotide primers in a polymerase chain reaction (PCR) or in other nucleic acid amplification methods for the purpose of amplifying a region from the nucleic acid sample that comprises the polymorphic variation. One oligonucleotide primer is complementary to a region 3' of the polymorphism and the other is complementary to a region 5' of the polymorphism. A PCR primer pair may be used in methods disclosed in U.S. Pat. Nos. 4,683,195; 4,683,202, 4,965,188; 5,656,493; 5,998,143; 6,140,054; WO 01/27327; and WO 01/27329 for example. PCR primer pairs may also be used in any commercially available machines that perform PCR, such as any of the GENEAMP® Systems available from Applied Biosystems. Also, those of ordinary skill in the art will be able to design oligonucleotide primers based upon a *PADI2*, *APOB*, *IL1RL2*, *WASPI*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence using knowledge available in the art.

[0093] Also provided is an extension oligonucleotide that hybridizes to the amplified fragment adjacent to the polymorphic variation. As used herein, the term "adjacent" refers to the 3' end of the extension oligonucleotide being often 1 nucleotide from the 5' end of the polymorphic site, and sometimes 2, 3, 4, 5, 6, 7, 8, 9, or 10 nucleotides from the 5' end of the polymorphic site, in the nucleic

acid when the extension oligonucleotide is hybridized to the nucleic acid. The extension oligonucleotide then is extended by one or more nucleotides, and the number and/or type of nucleotides that are added to the extension oligonucleotide determine whether the polymorphic variant is present. Oligonucleotide extension methods are disclosed, for example, in U.S. Pat. Nos. 4,656,127; 4,851,331; 5,679,524; 5,834,189; 5,876,934; 5,908,755; 5,912,118; 5,976,802; 5,981,186; 6,004,744; 6,013,431; 6,017,702; 6,046,005; 6,087,095; 6,210,891; and WO 01/20039. Oligonucleotide extension methods using mass spectrometry are described, for example, in U.S. Pat. Nos. 5,547,835; 5,605,798; 5,691,141; 5,849,542; 5,869,242; 5,928,906; 6,043,031; and 6,194,144, and a method often utilized is described herein in Example 2.

[0094] A microarray can be utilized for determining whether a polymorphic variant is present or absent in a nucleic acid sample. A microarray may include any oligonucleotides described herein, and methods for making and using oligonucleotide microarrays suitable for diagnostic use are disclosed in U.S. Pat. Nos. 5,492,806; 5,525,464; 5,589,330; 5,695,940; 5,849,483; 6,018,041; 6,045,996; 6,136,541; 6,142,681; 6,156,501; 6,197,506; 6,223,127; 6,225,625; 6,229,911; 6,239,273; WO 00/52625; WO 01/25485; and WO 01/29259. The microarray typically comprises a solid support and the oligonucleotides may be linked to this solid support by covalent bonds or by non-covalent interactions. The oligonucleotides may also be linked to the solid support directly or by a spacer molecule. A microarray may comprise one or more oligonucleotides complementary to a polymorphic site set forth herein.

[0095] A kit also may be utilized for determining whether a polymorphic variant is present or absent in a nucleic acid sample. A kit often comprises one or more pairs of oligonucleotide primers useful for amplifying a fragment of a nucleotide sequence of SEQ ID NO: 1-17 or a substantially identical sequence thereof, where the fragment includes a polymorphic site. The kit sometimes comprises a polymerizing agent, for example, a thermostable nucleic acid polymerase such as one disclosed in U.S. Pat. Nos. 4,889,818 or 6,077,664. Also, the kit often comprises an elongation oligonucleotide that hybridizes to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence in a nucleic acid sample adjacent to the polymorphic site. Where the kit includes an elongation oligonucleotide, it also often comprises chain elongating nucleotides, such as dATP, dTTP, dGTP, dCTP, and dITP, including analogs of dATP, dTTP, dGTP, dCTP and dITP, provided that such analogs are substrates for a thermostable nucleic acid polymerase and can be incorporated into a nucleic acid chain elongated from the extension oligonucleotide. Along with chain elongating nucleotides would be one or more chain terminating nucleotides such as ddATP, ddTTP, ddGTP, ddCTP, and the like. In an embodiment, the kit comprises one or more oligonucleotide primer pairs, a polymerizing agent, chain

elongating nucleotides, at least one elongation oligonucleotide, and one or more chain terminating nucleotides. Kits optionally include buffers, vials, microtiter plates, and instructions for use.

[0096] An individual identified as being at risk of osteoarthritis may be heterozygous or homozygous with respect to the allele associated with a higher risk of osteoarthritis. A subject homozygous for an allele associated with an increased risk of osteoarthritis is at a comparatively high risk of osteoarthritis, a subject heterozygous for an allele associated with an increased risk of osteoarthritis is at a comparatively intermediate risk of osteoarthritis, and a subject homozygous for an allele associated with a decreased risk of osteoarthritis is at a comparatively low risk of osteoarthritis. A genotype may be assessed for a complementary strand, such that the complementary nucleotide at a particular position is detected.

[0097] Also featured are methods for determining risk of osteoarthritis and/or identifying a subject at risk of osteoarthritis by contacting a polypeptide or protein encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence from a subject with an antibody that specifically binds to an epitope associated with increased risk of osteoarthritis in the polypeptide.

Applications of Prognostic and Diagnostic Results to Pharmacogenomic Methods

[0098] Pharmacogenomics is a discipline that involves tailoring a treatment for a subject according to the subject's genotype as a particular treatment regimen may exert a differential effect depending upon the subject's genotype. For example, based upon the outcome of a prognostic test described herein, a clinician or physician may target pertinent information and preventative or therapeutic treatments to a subject who would be benefited by the information or treatment and avoid directing such information and treatments to a subject who would not be benefited (e.g., the treatment has no therapeutic effect and/or the subject experiences adverse side effects).

[0099] The following is an example of a pharmacogenomic embodiment. A particular treatment regimen can exert a differential effect depending upon the subject's genotype. Where a candidate therapeutic exhibits a significant interaction with a major allele and a comparatively weak interaction with a minor allele (e.g., an order of magnitude or greater difference in the interaction), such a therapeutic typically would not be administered to a subject genotyped as being homozygous for the minor allele, and sometimes not administered to a subject genotyped as being heterozygous for the minor allele. In another example, where a candidate therapeutic is not significantly toxic when administered to subjects who are homozygous for a major allele but is comparatively toxic when administered to subjects heterozygous or homozygous for a minor allele, the candidate therapeutic is not typically administered to subjects who are genotyped as being heterozygous or homozygous with respect to the minor allele.

[0100] The methods described herein are applicable to pharmacogenomic methods for preventing, alleviating or treating osteoarthritis. For example, a nucleic acid sample from an individual may be subjected to a prognostic test described herein. Where one or more polymorphic variations associated with increased risk of osteoarthritis are identified in a subject, information for preventing or treating osteoarthritis and/or one or more osteoarthritis treatment regimens then may be prescribed to that subject.

[0101] In certain embodiments, a treatment or preventative regimen is specifically prescribed and/or administered to individuals who will most benefit from it based upon their risk of developing osteoarthritis assessed by the methods described herein. Thus, provided are methods for identifying a subject predisposed to osteoarthritis and then prescribing a therapeutic or preventative regimen to individuals identified as having a predisposition. Thus, certain embodiments are directed to a method for reducing osteoarthritis in a subject, which comprises: detecting the presence or absence of a polymorphic variant associated with osteoarthritis in a nucleotide sequence in a nucleic acid sample from a subject, where the nucleotide sequence comprises a polynucleotide sequence selected from the group consisting of: (a) a nucleotide sequence of SEQ ID NO: 1-17; (b) a nucleotide sequence which encodes a polypeptide consisting of an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17; (c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17, or a nucleotide sequence about 90% or more identical to a nucleotide sequence of SEQ ID NO: 1-17; and (d) a fragment of a polynucleotide sequence of (a), (b), or (c); and prescribing or administering a treatment regimen to a subject from whom the sample originated where the presence of a polymorphic variation associated with osteoarthritis is detected in the nucleotide sequence. In these methods, predisposition results may be utilized in combination with other test results to diagnose osteoarthritis.

[0102] Certain preventative treatments often are prescribed to subjects having a predisposition to osteoarthritis and where the subject is diagnosed with osteoarthritis or is diagnosed as having symptoms indicative of an early stage of osteoarthritis. The treatment sometimes is preventative (e.g., is prescribed or administered to reduce the probability that osteoarthritis arises or progresses), sometimes is therapeutic, and sometimes delays, alleviates or halts the progression of osteoarthritis. Any known preventative or therapeutic treatment for alleviating or preventing the occurrence of osteoarthritis is prescribed and/or administered. For example, the treatment often is directed to decreasing pain and improving joint movement. Examples of OA treatments include exercises to keep joints flexible and improve muscle strength. Different medications to control pain, including corticosteroids and nonsteroidal anti-inflammatory drugs (NSAIDs, e.g., Voltaren); cyclooxygenase-2 (COX-2) inhibitors (e.g., Celebrex, Vioxx, Mobic, and Bextra); monoclonal antibodies (e.g., Remicade); tumor necrosis factor inhibitors (e.g., Enbrel); or injections of glucocorticoids, hyaluronic acid or chondroitin sulfate into

joints that are inflamed and not responsive to NSAIDS. Orally administered chondroitin sulfate also may be used as a therapeutic, as it may increase hyaluronic acid levels and viscosity of synovial fluid, and decrease collagenase levels in synovial fluid. Also, glucosamine can serve as an OA therapeutic as delivering it into joints may inhibit enzymes involved in cartilage degradation and enhance the production of hyaluronic acid. For mild pain without inflammation, acetaminophen may be used. Other treatments include: heat/cold therapy for temporary pain relief; joint protection to prevent strain or stress on painful joints; surgery to relieve chronic pain in damaged joints; and weight control to prevent extra stress on weight-bearing joints.

[0103] As therapeutic approaches for treating osteoarthritis continue to evolve and improve, the goal of treatments for osteoarthritis related disorders is to intervene even before clinical signs first manifest. Thus, genetic markers associated with susceptibility to osteoarthritis prove useful for early diagnosis, prevention and treatment of osteoarthritis.

[0104] As osteoarthritis preventative and treatment information can be specifically targeted to subjects in need thereof (e.g., those at risk of developing osteoarthritis or those in an early stage of osteoarthritis), provided herein is a method for preventing or reducing the risk of developing osteoarthritis in a subject, which comprises: (a) detecting the presence or absence of a polymorphic variation associated with osteoarthritis at a polymorphic site in a nucleotide sequence in a nucleic acid sample from a subject; (b) identifying a subject with a predisposition to osteoarthritis, whereby the presence of the polymorphic variation is indicative of a predisposition to osteoarthritis in the subject; and (c) if such a predisposition is identified, providing the subject with information about methods or products to prevent or reduce osteoarthritis or to delay the onset of osteoarthritis. Also provided is a method of targeting information or advertising to a subpopulation of a human population based on the subpopulation being genetically predisposed to a disease or condition, which comprises: (a) detecting the presence or absence of a polymorphic variation associated with osteoarthritis at a polymorphic site in a nucleotide sequence in a nucleic acid sample from a subject; (b) identifying the subpopulation of subjects in which the polymorphic variation is associated with osteoarthritis; and (c) providing information only to the subpopulation of subjects about a particular product which may be obtained and consumed or applied by the subject to help prevent or delay onset of the disease or condition.

[0105] Pharmacogenomics methods also may be used to analyze and predict a response to osteoarthritis treatment or a drug. For example, if pharmacogenomics analysis indicates a likelihood that an individual will respond positively to osteoarthritis treatment with a particular drug, the drug may be administered to the individual. Conversely, if the analysis indicates that an individual is likely to respond negatively to treatment with a particular drug, an alternative course of treatment may be prescribed. A negative response may be defined as either the absence of an efficacious response or the presence of toxic

side effects. The response to a therapeutic treatment can be predicted in a background study in which subjects in any of the following populations are genotyped: a population that responds favorably to a treatment regimen, a population that does not respond significantly to a treatment regimen, and a population that responds adversely to a treatment regimen (*e.g.*, exhibits one or more side effects). These populations are provided as examples and other populations and subpopulations may be analyzed. Based upon the results of these analyses, a subject is genotyped to predict whether he or she will respond favorably to a treatment regimen, not respond significantly to a treatment regimen, or respond adversely to a treatment regimen.

[0106] The tests described herein also are applicable to clinical drug trials. One or more polymorphic variants indicative of response to an agent for treating osteoarthritis or to side effects to an agent for treating osteoarthritis may be identified using the methods described herein. Thereafter, potential participants in clinical trials of such an agent may be screened to identify those individuals most likely to respond favorably to the drug and exclude those likely to experience side effects. In that way, the effectiveness of drug treatment may be measured in individuals who respond positively to the drug, without lowering the measurement as a result of the inclusion of individuals who are unlikely to respond positively in the study and without risking undesirable safety problems.

[0107] Thus, another embodiment is a method of selecting an individual for inclusion in a clinical trial of a treatment or drug comprising the steps of: (a) obtaining a nucleic acid sample from an individual; (b) determining the identity of a polymorphic variation which is associated with a positive response to the treatment or the drug, or at least one polymorphic variation which is associated with a negative response to the treatment or the drug in the nucleic acid sample, and (c) including the individual in the clinical trial if the nucleic acid sample contains said polymorphic variation associated with a positive response to the treatment or the drug or if the nucleic acid sample lacks said polymorphic variation associated with a negative response to the treatment or the drug. In addition, the methods described herein for selecting an individual for inclusion in a clinical trial of a treatment or drug encompass methods with any further limitation described in this disclosure, or those following, specified alone or in any combination. The polymorphic variation may be in a sequence selected individually or in any combination from the group consisting of (i) a nucleotide sequence of SEQ ID NO: 1-17; (ii) a nucleotide sequence which encodes a polypeptide consisting of an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17; (iii) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17, or a nucleotide sequence about 90% or more identical to a nucleotide sequence of SEQ ID NO: 1-17; and (iv) a fragment of a polynucleotide sequence of (i), (ii), or (iii) comprising the polymorphic site. The including step (c) optionally comprises administering the drug or the treatment to the individual if the

nucleic acid sample contains the polymorphic variation associated with a positive response to the treatment or the drug and the nucleic acid sample lacks said biallelic marker associated with a negative response to the treatment or the drug.

[0108] Also provided herein is a method of partnering between a diagnostic/prognostic testing provider and a provider of a consumable product, which comprises: (a) the diagnostic/prognostic testing provider detects the presence or absence of a polymorphic variation associated with osteoarthritis at a polymorphic site in a nucleotide sequence in a nucleic acid sample from a subject; (b) the diagnostic/prognostic testing provider identifies the subpopulation of subjects in which the polymorphic variation is associated with osteoarthritis; (c) the diagnostic/prognostic testing provider forwards information to the subpopulation of subjects about a particular product which may be obtained and consumed or applied by the subject to help prevent or delay onset of the disease or condition; and (d) the provider of a consumable product forwards to the diagnostic test provider a fee every time the diagnostic/prognostic test provider forwards information to the subject as set forth in step (c) above.

Compositions Comprising Osteoarthritis-Directed Molecules

[0109] Featured herein is a composition comprising a cell from a subject having osteoarthritis or at risk of osteoarthritis and one or more molecules specifically directed and targeted to a nucleic acid comprising a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence or amino acid sequence. Such directed molecules include, but are not limited to, a compound that binds to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence or amino acid sequence referenced herein; a RNAi or siRNA molecule having a strand complementary or substantially complementary to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence (e.g., hybridizes to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence under conditions of high stringency); an antisense nucleic acid complementary or substantially complementary to an RNA encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence (e.g., hybridizes to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence under conditions of high stringency); a ribozyme that hybridizes to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence (e.g., hybridizes to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence under conditions of high stringency); a nucleic acid aptamer that specifically binds a polypeptide encoded by *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence; and an antibody that specifically binds to a polypeptide encoded by *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence or binds to a nucleic

acid having such a nucleotide sequence. In an embodiment, the antibody selectively binds to an epitope comprising an amino acid encoded by rs1367117 in *APOB*. In specific embodiments, the osteoarthritis directed molecule interacts with a nucleic acid or polypeptide variant associated with osteoarthritis, such as variants referenced herein. In other embodiments, the osteoarthritis directed molecule interacts with a polypeptide involved in a signal pathway of a polypeptide encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence, or a nucleic acid comprising such a nucleotide sequence.

[0110] Compositions sometimes include an adjuvant known to stimulate an immune response, and in certain embodiments, an adjuvant that stimulates a T-cell lymphocyte response. Adjuvants are known, including but not limited to an aluminum adjuvant (e.g., aluminum hydroxide); a cytokine adjuvant or adjuvant that stimulates a cytokine response (e.g., interleukin (IL)-12 and/or gamma-interferon cytokines); a Freund-type mineral oil adjuvant emulsion (e.g., Freund's complete or incomplete adjuvant); a synthetic lipid compound; a copolymer adjuvant (e.g., TitreMax); a saponin; Quil A; a liposome; an oil-in-water emulsion (e.g., an emulsion stabilized by Tween 80 and pluronic polyoxyethylene/polyoxypropylene block copolymer (Syntex Adjuvant Formulation); TitreMax; detoxified endotoxin (MPL) and mycobacterial cell wall components (TDW, CWS) in 2% squalene (Ribi Adjuvant System)); a muramyl dipeptide; an immune-stimulating complex (ISCOM, e.g., an Ag-modified saponin/cholesterol micelle that forms stable cage-like structure); an aqueous phase adjuvant that does not have a depot effect (e.g., Gerbu adjuvant); a carbohydrate polymer (e.g., AdjuPrime); L-tyrosine; a manide-oleate compound (e.g., Montanide); an ethylene-vinyl acetate copolymer (e.g., Elvax 40W1,2); or lipid A, for example. Such compositions are useful for generating an immune response against osteoarthritis directed molecule (e.g., an HLA-binding subsequence within a polypeptide encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence). In such methods, a peptide having an amino acid subsequence of a polypeptide encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence is delivered to a subject, where the subsequence binds to an HLA molecule and induces a CTL lymphocyte response. The peptide sometimes is delivered to the subject as an isolated peptide or as a minigene in a plasmid that encodes the peptide. Methods for identifying HLA-binding subsequences in such polypeptides are known (see e.g., publication WO02/20616 and PCT application US98/01373 for methods of identifying such sequences).

[0111] The cell may be in a group of cells cultured *in vitro* or in a tissue maintained *in vitro* or present in an animal *in vivo* (e.g., a rat, mouse, ape or human). In certain embodiments, a composition comprises a component from a cell such as a nucleic acid molecule (e.g., genomic DNA), a protein mixture or isolated protein, for example. The aforementioned compositions have utility in diagnostic,

prognostic and pharmacogenomic methods described previously and in therapeutics described hereafter. Certain osteoarthritis directed molecules are described in greater detail below.

Compounds

[0112] Compounds can be obtained using any of the numerous approaches in combinatorial library methods known in the art, including: biological libraries; peptoid libraries (libraries of molecules having the functionalities of peptides, but with a novel, non-peptide backbone which are resistant to enzymatic degradation but which nevertheless remain bioactive (see, e.g., Zuckermann et al., *J. Med. Chem.* 37: 2678-85 (1994)); spatially addressable parallel solid phase or solution phase libraries; synthetic library methods requiring deconvolution; "one-bead one-compound" library methods; and synthetic library methods using affinity chromatography selection. Biological library and peptoid library approaches are typically limited to peptide libraries, while the other approaches are applicable to peptide, non-peptide oligomer or small molecule libraries of compounds (Lam, *Anticancer Drug Des.* 12: 145, (1997)). Examples of methods for synthesizing molecular libraries are described, for example, in DeWitt et al., *Proc. Natl. Acad. Sci. U.S.A.* 90: 6909 (1993); Erb et al., *Proc. Natl. Acad. Sci. USA* 91: 11422 (1994); Zuckermann et al., *J. Med. Chem.* 37: 2678 (1994); Cho et al., *Science* 261: 1303 (1993); Carrell et al., *Angew. Chem. Int. Ed. Engl.* 33: 2059 (1994); Carell et al., *Angew. Chem. Int. Ed. Engl.* 33: 2061 (1994); and in Gallop et al., *J. Med. Chem.* 37: 1233 (1994).

[0113] Libraries of compounds may be presented in solution (e.g., Houghten, *Biotechniques* 13: 412-421 (1992)), or on beads (Lam, *Nature* 354: 82-84 (1991)), chips (Fodor, *Nature* 364: 555-556 (1993)), bacteria or spores (Ladner, United States Patent No. 5,223,409), plasmids (Cull et al., *Proc. Natl. Acad. Sci. USA* 89: 1865-1869 (1992)) or on phage (Scott and Smith, *Science* 249: 386-390 (1990); Devlin, *Science* 249: 404-406 (1990); Cwirla et al., *Proc. Natl. Acad. Sci.* 87: 6378-6382 (1990); Felici, *J. Mol. Biol.* 222: 301-310 (1991); Ladner supra.).

[0114] A compound sometimes alters expression and sometimes alters activity of a polypeptide target and may be a small molecule. Small molecules include, but are not limited to, peptides, peptidomimetics (e.g., peptoids), amino acids, amino acid analogs, polynucleotides, polynucleotide analogs, nucleotides, nucleotide analogs, organic or inorganic compounds (i.e., including heteroorganic and organometallic compounds) having a molecular weight less than about 10,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 5,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 1,000 grams per mole, organic or inorganic compounds having a molecular weight less than about 500 grams per mole, and salts, esters, and other pharmaceutically acceptable forms of such compounds.

Antisense Nucleic Acid Molecules, Ribozymes, RNAi, siRNA and Modified Nucleic Acid Molecules

[0115] An "antisense" nucleic acid refers to a nucleotide sequence complementary to a "sense" nucleic acid encoding a polypeptide, e.g., complementary to the coding strand of a double-stranded cDNA molecule or complementary to an mRNA sequence. The antisense nucleic acid can be complementary to an entire coding strand, or to a portion thereof or a substantially identical sequence thereof. In another embodiment, the antisense nucleic acid molecule is antisense to a "noncoding region" of the coding strand of a nucleotide sequence (e.g., 5' and 3' untranslated regions in SEQ ID NO: 1).

[0116] An antisense nucleic acid can be designed such that it is complementary to the entire coding region of an mRNA encoded by a nucleotide sequence (e.g., SEQ ID NO: 1), and often the antisense nucleic acid is an oligonucleotide antisense to only a portion of a coding or noncoding region of the mRNA. For example, the antisense oligonucleotide can be complementary to the region surrounding the translation start site of the mRNA, e.g., between the -10 and +10 regions of the target gene nucleotide sequence of interest. An antisense oligonucleotide can be, for example, about 7, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, or more nucleotides in length. The antisense nucleic acids, which include the ribozymes described hereafter, can be designed to target a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence, often a variant associated with osteoarthritis, or a substantially identical sequence thereof. Among the variants, minor alleles and major alleles can be targeted, and those associated with a higher risk of osteoarthritis are often designed, tested, and administered to subjects.

[0117] An antisense nucleic acid can be constructed using chemical synthesis and enzymatic ligation reactions using standard procedures. For example, an antisense nucleic acid (e.g., an antisense oligonucleotide) can be chemically synthesized using naturally occurring nucleotides or variously modified nucleotides designed to increase the biological stability of the molecules or to increase the physical stability of the duplex formed between the antisense and sense nucleic acids, e.g., phosphorothioate derivatives and acridine substituted nucleotides can be used. Antisense nucleic acid also can be produced biologically using an expression vector into which a nucleic acid has been subcloned in an antisense orientation (i.e., RNA transcribed from the inserted nucleic acid will be of an antisense orientation to a target nucleic acid of interest, described further in the following subsection).

[0118] When utilized as therapeutics, antisense nucleic acids typically are administered to a subject (e.g., by direct injection at a tissue site) or generated in situ such that they hybridize with or bind to cellular mRNA and/or genomic DNA encoding a polypeptide and thereby inhibit expression of the polypeptide, for example, by inhibiting transcription and/or translation. Alternatively, antisense nucleic acid molecules can be modified to target selected cells and then are administered systemically. For

systemic administration, antisense molecules can be modified such that they specifically bind to receptors or antigens expressed on a selected cell surface, for example, by linking antisense nucleic acid molecules to peptides or antibodies which bind to cell surface receptors or antigens. Antisense nucleic acid molecules can also be delivered to cells using the vectors described herein. Sufficient intracellular concentrations of antisense molecules are achieved by incorporating a strong promoter, such as a pol II or pol III promoter, in the vector construct.

[0119] Antisense nucleic acid molecules sometimes are alpha-anomeric nucleic acid molecules. An alpha-anomeric nucleic acid molecule forms specific double-stranded hybrids with complementary RNA in which, contrary to the usual beta-units, the strands run parallel to each other (Gaultier et al., *Nucleic Acids. Res.* 15: 6625-6641 (1987)). Antisense nucleic acid molecules can also comprise a 2'-o-methylribonucleotide (Inoue et al., *Nucleic Acids Res.* 15: 6131-6148 (1987)) or a chimeric RNA-DNA analogue (Inoue et al., *FEBS Lett.* 215: 327-330 (1987)). Antisense nucleic acids sometimes are composed of DNA or PNA or any other nucleic acid derivatives described previously.

[0120] In another embodiment, an antisense nucleic acid is a ribozyme. A ribozyme having specificity for a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence can include one or more sequences complementary to such a nucleotide sequence, and a sequence having a known catalytic region responsible for mRNA cleavage (see e.g., U.S. Pat. No. 5,093,246 or Haselhoff and Gerlach, *Nature* 334: 585-591 (1988)). For example, a derivative of a Tetrahymena L-19 IVS RNA is sometimes utilized in which the nucleotide sequence of the active site is complementary to the nucleotide sequence to be cleaved in a mRNA (see e.g., Cech et al. U.S. Patent No. 4,987,071; and Cech et al. U.S. Patent No. 5,116,742). Also, target mRNA sequences can be used to select a catalytic RNA having a specific ribonuclease activity from a pool of RNA molecules (see e.g., Bartel & Szostak, *Science* 261: 1411-1418 (1993)).

[0121] Osteoarthritis directed molecules include in certain embodiments nucleic acids that can form triple helix structures with a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleotide sequence, or a substantially identical sequence thereof, especially one that includes a regulatory region that controls expression of a polypeptide. Gene expression can be inhibited by targeting nucleotide sequences complementary to the regulatory region of a nucleotide sequence referenced herein or a substantially identical sequence (e.g., promoter and/or enhancers) to form triple helical structures that prevent transcription of a gene in target cells (see e.g., Helene, *Anticancer Drug Des.* 6(6): 569-84 (1991); Helene et al., *Ann. N.Y. Acad. Sci.* 660: 27-36 (1992); and Maher, *Bioassays* 14(12): 807-15 (1992). Potential sequences that can be targeted for triple helix formation can be increased by creating a so-called "switchback" nucleic acid molecule. Switchback molecules are synthesized in an alternating 5'-3', 3'-5' manner, such that they base pair with first one strand of a duplex

and then the other, eliminating the necessity for a sizeable stretch of either purines or pyrimidines to be present on one strand of a duplex.

[0122] Osteoarthritis directed molecules include RNAi and siRNA nucleic acids. Gene expression may be inhibited by the introduction of double-stranded RNA (dsRNA), which induces potent and specific gene silencing, a phenomenon called RNA interference or RNAi. See, e.g., Fire et al., US Patent Number 6,506,559; Tuschl et al. PCT International Publication No. WO 01/75164; Kay et al. PCT International Publication No. WO 03/010180A1; or Bosher JM, Labouesse, Nat Cell Biol 2000 Feb;2(2):E31-6. This process has been improved by decreasing the size of the double-stranded RNA to 20-24 base pairs (to create small-interfering RNAs or siRNAs) that “switched off” genes in mammalian cells without initiating an acute phase response, i.e., a host defense mechanism that often results in cell death (see, e.g., Caplen et al. Proc Natl Acad Sci U S A. 2001 Aug 14;98(17):9742-7 and Elbashir et al. Methods 2002 Feb;26(2):199-213). There is increasing evidence of post-transcriptional gene silencing by RNA interference (RNAi) for inhibiting targeted expression in mammalian cells at the mRNA level, in human cells. There is additional evidence of effective methods for inhibiting the proliferation and migration of tumor cells in human patients, and for inhibiting metastatic cancer development (see, e.g., U.S. Patent Application No. US2001000993183; Caplen et al. Proc Natl Acad Sci U S A; and Abderrahmani et al. Mol Cell Biol 2001 Nov21(21):7256-67).

[0123] An “siRNA” or “RNAi” refers to a nucleic acid that forms a double stranded RNA and has the ability to reduce or inhibit expression of a gene or target gene when the siRNA is delivered to or expressed in the same cell as the gene or target gene. “siRNA” refers to short double-stranded RNA formed by the complementary strands. Complementary portions of the siRNA that hybridize to form the double stranded molecule often have substantial or complete identity to the target molecule sequence. In one embodiment, an siRNA refers to a nucleic acid that has substantial or complete identity to a target gene and forms a double stranded siRNA.

[0124] When designing the siRNA molecules, the targeted region often is selected from a given DNA sequence beginning 50 to 100 nucleotides downstream of the start codon. See, e.g., Elbashir et al., Methods 26:199-213 (2002). Initially, 5' or 3' UTRs and regions nearby the start codon were avoided assuming that UTR-binding proteins and/or translation initiation complexes may interfere with binding of the siRNP or RISC endonuclease complex. Sometimes regions of the target 23 nucleotides in length conforming to the sequence motif AA(N19)TT (N, an nucleotide), and regions with approximately 30% to 70% G/C-content (often about 50% G/C-content) often are selected. If no suitable sequences are found, the search often is extended using the motif NA(N21). The sequence of the sense siRNA sometimes corresponds to (N19) TT or N21 (position 3 to 23 of the 23-nt motif), respectively. In the latter case, the 3' end of the sense siRNA often is converted to TT. The rationale for this sequence

conversion is to generate a symmetric duplex with respect to the sequence composition of the sense and antisense 3' overhangs. The antisense siRNA is synthesized as the complement to position 1 to 21 of the 23-nt motif. Because position 1 of the 23-nt motif is not recognized sequence-specifically by the antisense siRNA, the 3'-most nucleotide residue of the antisense siRNA can be chosen deliberately. However, the penultimate nucleotide of the antisense siRNA (complementary to position 2 of the 23-nt motif) often is complementary to the targeted sequence. For simplifying chemical synthesis, TT often is utilized. siRNAs corresponding to the target motif NAR(N17)YNN, where R is purine (A,G) and Y is pyrimidine (C,U), often are selected. Respective 21 nucleotide sense and antisense siRNAs often begin with a purine nucleotide and can also be expressed from pol III expression vectors without a change in targeting site. Expression of RNAs from pol III promoters often is efficient when the first transcribed nucleotide is a purine.

[0125] The sequence of the siRNA can correspond to the full length target gene, or a subsequence thereof. Often, the siRNA is about 15 to about 50 nucleotides in length (e.g., each complementary sequence of the double stranded siRNA is 15-50 nucleotides in length, and the double stranded siRNA is about 15-50 base pairs in length, sometimes about 20-30 nucleotides in length or about 20-25 nucleotides in length, e.g., 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, or 30 nucleotides in length. The siRNA sometimes is about 21 nucleotides in length. Methods of using siRNA are well known in the art, and specific siRNA molecules may be purchased from a number of companies including Dharmacon Research, Inc.

[0126] Antisense, ribozyme, RNAi and siRNA nucleic acids can be altered to form modified nucleic acid molecules. The nucleic acids can be altered at base moieties, sugar moieties or phosphate backbone moieties to improve stability, hybridization, or solubility of the molecule. For example, the deoxyribose phosphate backbone of nucleic acid molecules can be modified to generate peptide nucleic acids (see Hyrup et al., *Bioorganic & Medicinal Chemistry* 4 (1): 5-23 (1996)). As used herein, the terms "peptide nucleic acid" or "PNA" refers to a nucleic acid mimic such as a DNA mimic, in which the deoxyribose phosphate backbone is replaced by a pseudopeptide backbone and only the four natural nucleobases are retained. The neutral backbone of a PNA can allow for specific hybridization to DNA and RNA under conditions of low ionic strength. Synthesis of PNA oligomers can be performed using standard solid phase peptide synthesis protocols as described, for example, in Hyrup et al., (1996) *supra* and Perry-O'Keefe et al., *Proc. Natl. Acad. Sci.* 93: 14670-675 (1996).

[0127] PNA nucleic acids can be used in prognostic, diagnostic, and therapeutic applications. For example, PNAs can be used as antisense or antigenic agents for sequence-specific modulation of gene expression by, for example, inducing transcription or translation arrest or inhibiting replication. PNA nucleic acid molecules can also be used in the analysis of single base pair mutations in a gene, (e.g., by PNA-directed PCR clamping); as "artificial restriction enzymes" when used in combination with other

enzymes, (e.g., S1 nucleases (Hyrup (1996) supra)); or as probes or primers for DNA sequencing or hybridization (Hyrup et al., (1996) supra; Perry-O'Keefe supra).

[0128] In other embodiments, oligonucleotides may include other appended groups such as peptides (e.g., for targeting host cell receptors in vivo), or agents facilitating transport across cell membranes (see e.g., Letsinger et al., Proc. Natl. Acad. Sci. USA 86: 6553-6556 (1989); Lemaitre et al., Proc. Natl. Acad. Sci. USA 84: 648-652 (1987); PCT Publication No. W088/09810) or the blood-brain barrier (see, e.g., PCT Publication No. W089/10134). In addition, oligonucleotides can be modified with hybridization-triggered cleavage agents (See, e.g., Krol et al., Bio-Techniques 6: 958-976 (1988)) or intercalating agents. (See, e.g., Zon, Pharm. Res. 5: 539-549 (1988)). To this end, the oligonucleotide may be conjugated to another molecule, (e.g., a peptide, hybridization triggered cross-linking agent, transport agent, or hybridization-triggered cleavage agent).

[0129] Also included herein are molecular beacon oligonucleotide primer and probe molecules having one or more regions complementary to a *PADI2*, *APOB*, *IL1RL2*, *WASPI*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence, or a substantially identical sequence thereof, two complementary regions one having a fluorophore and one a quencher such that the molecular beacon is useful for quantifying the presence of the nucleic acid in a sample. Molecular beacon nucleic acids are described, for example, in Lizardi et al., U.S. Patent No. 5,854,033; Nazarenko et al., U.S. Patent No. 5,866,336, and Livak et al., U.S. Patent 5,876,930.

Antibodies

[0130] The term "antibody" as used herein refers to an immunoglobulin molecule or immunologically active portion thereof, i.e., an antigen-binding portion. Examples of immunologically active portions of immunoglobulin molecules include F(ab) and F(ab')₂ fragments which can be generated by treating the antibody with an enzyme such as pepsin. An antibody sometimes is a polyclonal, monoclonal, recombinant (e.g., a chimeric or humanized), fully human, non-human (e.g., murine), or a single chain antibody. An antibody may have effector function and can fix complement, and is sometimes coupled to a toxin or imaging agent.

[0131] A full-length polypeptide or antigenic peptide fragment encoded by a nucleotide sequence referenced herein can be used as an immunogen or can be used to identify antibodies made with other immunogens, e.g., cells, membrane preparations, and the like. An antigenic peptide often includes at least 8 amino acid residues of the amino acid sequences encoded by a nucleotide sequence referenced herein, or substantially identical sequence thereof, and encompasses an epitope. Antigenic peptides sometimes include 10 or more amino acids, 15 or more amino acids, 20 or more amino acids, or 30 or

more amino acids. Hydrophilic and hydrophobic fragments of polypeptides sometimes are used as immunogens.

[0132] Epitopes encompassed by the antigenic peptide are regions located on the surface of the polypeptide (e.g., hydrophilic regions) as well as regions with high antigenicity. For example, an Emin surface probability analysis of the human polypeptide sequence can be used to indicate the regions that have a particularly high probability of being localized to the surface of the polypeptide and are thus likely to constitute surface residues useful for targeting antibody production. The antibody may bind an epitope on any domain or region on polypeptides described herein.

[0133] Also, chimeric, humanized, and completely human antibodies are useful for applications which include repeated administration to subjects. Chimeric and humanized monoclonal antibodies, comprising both human and non-human portions, can be made using standard recombinant DNA techniques. Such chimeric and humanized monoclonal antibodies can be produced by recombinant DNA techniques known in the art, for example using methods described in Robinson et al International Application No. PCT/US86/02269; Akira, et al European Patent Application 184,187; Taniguchi, M., European Patent Application 171,496; Morrison et al European Patent Application 173,494; Neuberger et al PCT International Publication No. WO 86/01533; Cabilly et al U.S. Patent No. 4,816,567; Cabilly et al European Patent Application 125,023; Better et al., Science 240: 1041-1043 (1988); Liu et al., Proc. Natl. Acad. Sci. USA 84: 3439-3443 (1987); Liu et al., J. Immunol. 139: 3521-3526 (1987); Sun et al., Proc. Natl. Acad. Sci. USA 84: 214-218 (1987); Nishimura et al., Canc. Res. 47: 999-1005 (1987); Wood et al., Nature 314: 446-449 (1985); and Shaw et al., J. Natl. Cancer Inst. 80: 1553-1559 (1988); Morrison, S. L., Science 229: 1202-1207 (1985); Oi et al., BioTechniques 4: 214 (1986); Winter U.S. Patent 5,225,539; Jones et al., Nature 321: 552-525 (1986); Verhoeyan et al., Science 239: 1534; and Beidler et al., J. Immunol. 141: 4053-4060 (1988).

[0134] Completely human antibodies are particularly desirable for therapeutic treatment of human patients. Such antibodies can be produced using transgenic mice that are incapable of expressing endogenous immunoglobulin heavy and light chains genes, but which can express human heavy and light chain genes. See, for example, Lonberg and Huszar, Int. Rev. Immunol. 13: 65-93 (1995); and U.S. Patent Nos. 5,625,126; 5,633,425; 5,569,825; 5,661,016; and 5,545,806. In addition, companies such as Abgenix, Inc. (Fremont, CA) and Medarex, Inc. (Princeton, NJ), can be engaged to provide human antibodies directed against a selected antigen using technology similar to that described above. Completely human antibodies that recognize a selected epitope also can be generated using a technique referred to as "guided selection." In this approach a selected non-human monoclonal antibody (e.g., a murine antibody) is used to guide the selection of a completely human antibody recognizing the same epitope. This technology is described for example by Jaspers et al., Bio/Technology 12: 899-903 (1994).

[0135] An antibody can be a single chain antibody. A single chain antibody (scFV) can be engineered (see, e.g., Colcher et al., Ann. N Y Acad. Sci. 880: 263-80 (1999); and Reiter, Clin. Cancer Res. 2: 245-52 (1996)). Single chain antibodies can be dimerized or multimerized to generate multivalent antibodies having specificities for different epitopes of the same target polypeptide.

[0136] Antibodies also may be selected or modified so that they exhibit reduced or no ability to bind an Fc receptor. For example, an antibody may be an isotype or subtype, fragment or other mutant, which does not support binding to an Fc receptor (e.g., it has a mutagenized or deleted Fc receptor binding region).

[0137] Also, an antibody (or fragment thereof) may be conjugated to a therapeutic moiety such as a cytotoxin, a therapeutic agent or a radioactive metal ion. A cytotoxin or cytotoxic agent includes any agent that is detrimental to cells. Examples include taxol, cytochalasin B, gramicidin D, ethidium bromide, emetine, mitomycin, etoposide, tenoposide, vincristine, vinblastine, colchicin, doxorubicin, daunorubicin, dihydroxy anthracin dione, mitoxantrone, mithramycin, actinomycin D, 1 dehydrotestosterone, glucocorticoids, procaine, tetracaine, lidocaine, propranolol, and puromycin and analogs or homologs thereof. Therapeutic agents include, but are not limited to, antimetabolites (e.g., methotrexate, 6-mercaptopurine, 6-thioguanine, cytarabine, 5-fluorouracil decarbazine), alkylating agents (e.g., mechlorethamine, thiopeta chlorambucil, melphalan, carmustine (BCNU) and lomustine (CCNU), cyclophosphamide, busulfan, dibromomannitol, streptozotocin, mitomycin C, and cis-dichlorodiamine platinum (II) (DDP) cisplatin), anthracyclines (e.g., daunorubicin (formerly daunomycin) and doxorubicin), antibiotics (e.g., dactinomycin (formerly actinomycin), bleomycin, mithramycin, and anthramycin (AMC)), and anti-mitotic agents (e.g., vincristine and vinblastine).

[0138] Antibody conjugates can be used for modifying a given biological response. For example, the drug moiety may be a protein or polypeptide possessing a desired biological activity. Such proteins may include, for example, a toxin such as abrin, ricin A, pseudomonas exotoxin, or diphtheria toxin; a polypeptide such as tumor necrosis factor, gamma-interferon, alpha-interferon, nerve growth factor, platelet derived growth factor, tissue plasminogen activator; or, biological response modifiers such as, for example, lymphokines, interleukin-1 ("IL-1"), interleukin-2 ("IL-2"), interleukin-6 ("IL-6"), granulocyte macrophage colony stimulating factor ("GM-CSF"), granulocyte colony stimulating factor ("G-CSF"), or other growth factors. Also, an antibody can be conjugated to a second antibody to form an antibody heteroconjugate as described by Segal in U.S. Patent No. 4,676,980, for example.

[0139] An antibody (e.g., monoclonal antibody) can be used to isolate target polypeptides by standard techniques, such as affinity chromatography or immunoprecipitation. Moreover, an antibody can be used to detect a target polypeptide (e.g., in a cellular lysate or cell supernatant) in order to evaluate the abundance and pattern of expression of the polypeptide. Antibodies can be used diagnostically to

monitor polypeptide levels in tissue as part of a clinical testing procedure, e.g., to determine the efficacy of a given treatment regimen. Detection can be facilitated by coupling (i.e., physically linking) the antibody to a detectable substance (i.e., antibody labeling). Examples of detectable substances include various enzymes, prosthetic groups, fluorescent materials, luminescent materials, bioluminescent materials, and radioactive materials. Examples of suitable enzymes include horseradish peroxidase, alkaline phosphatase, β -galactosidase, or acetylcholinesterase; examples of suitable prosthetic group complexes include streptavidin/biotin and avidin/biotin; examples of suitable fluorescent materials include umbelliferone, fluorescein, fluorescein isothiocyanate, rhodamine, dichlorotriazinylamine fluorescein, dansyl chloride or phycoerythrin; an example of a luminescent material includes luminol; examples of bioluminescent materials include luciferase, luciferin, and aequorin, and examples of suitable radioactive material include ^{125}I , ^{131}I , ^{35}S or ^3H . Also, an antibody can be utilized as a test molecule for determining whether it can treat osteoarthritis, and as a therapeutic for administration to a subject for treating osteoarthritis.

[0140] An antibody can be made by immunizing with a purified antigen, or a fragment thereof, e.g., a fragment described herein, a membrane associated antigen, tissues, e.g., crude tissue preparations, whole cells, preferably living cells, lysed cells, or cell fractions.

[0141] Included herein are antibodies which bind only a native polypeptide, only denatured or otherwise non-native polypeptide, or which bind both, as well as those having linear or conformational epitopes. Conformational epitopes sometimes can be identified by selecting antibodies that bind to native but not denatured polypeptide. Also featured are antibodies that specifically bind to a polypeptide variant associated with osteoarthritis.

Methods for Identifying Candidate Therapeutics for Treating Osteoarthritis

[0142] Current therapies for the treatment of osteoarthritis have limited efficacy, limited tolerability and significant mechanism-based side effects, and few of the available therapies adequately address underlying defects. Current therapeutic approaches were largely developed in the absence of defined molecular targets or even a solid understanding of disease pathogenesis. Therefore, provided are methods of identifying candidate therapeutics that target biochemical pathways related to the development of osteoarthritis.

[0143] Thus, featured herein are methods for identifying a candidate therapeutic for treating osteoarthritis. The methods comprise contacting a test molecule with a target molecule in a system. A "target molecule" as used herein refers to a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleic acid, a substantially identical nucleic acid thereof, or a fragment thereof, and an encoded polypeptide of the foregoing. The methods also comprise determining the presence or

absence of an interaction between the test molecule and the target molecule, where the presence of an interaction between the test molecule and the nucleic acid or polypeptide identifies the test molecule as a candidate osteoarthritis therapeutic. The interaction between the test molecule and the target molecule may be quantified.

[0144] Test molecules and candidate therapeutics include, but are not limited to, compounds, antisense nucleic acids, siRNA molecules, ribozymes, polypeptides or proteins encoded by a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleotide sequence, or a substantially identical sequence or fragment thereof, and immunotherapeutics (e.g., antibodies and HLA-presented polypeptide fragments). A test molecule or candidate therapeutic may act as a modulator of target molecule concentration or target molecule function in a system. A “modulator” may agonize (i.e., up-regulates) or antagonize (i.e., down-regulates) a target molecule concentration partially or completely in a system by affecting such cellular functions as DNA replication and/or DNA processing (e.g., DNA methylation or DNA repair), RNA transcription and/or RNA processing (e.g., removal of intronic sequences and/or translocation of spliced mRNA from the nucleus), polypeptide production (e.g., translation of the polypeptide from mRNA), and/or polypeptide post-translational modification (e.g., glycosylation, phosphorylation, and proteolysis of pro-polypeptides). A modulator may also agonize or antagonize a biological function of a target molecule partially or completely, where the function may include adopting a certain structural conformation, interacting with one or more binding partners, ligand binding, catalysis (e.g., phosphorylation, dephosphorylation, hydrolysis, methylation, and isomerization), and an effect upon a cellular event (e.g., effecting progression of osteoarthritis). Any modulator may be utilized, such as a peptidyl arginine deiminase modulator (e.g., *PADI2* likely is a peptidyl arginine deiminase) described in WO-09851784 and WO0244360A2 or an apolipoprotein (e.g., *APOB* includes an apolipoprotein domain) modulatory compound (e.g., WO-2004017969, WO-03002533, US 6,369,075, WO-02098839, WO-02098871, WO-00177077, WO-00153260, WO-00105767), antibody (e.g., WO-9600903A1, US 6,309,844 and US 5,330,910) or antisense molecule (e.g., WO03011887A2 and WO03097662A1).

[0145] As used herein, the term “system” refers to a cell free *in vitro* environment and a cell-based environment such as a collection of cells, a tissue, an organ, or an organism. A system is “contacted” with a test molecule in a variety of manners, including adding molecules in solution and allowing them to interact with one another by diffusion, cell injection, and any administration routes in an animal. As used herein, the term “interaction” refers to an effect of a test molecule on test molecule, where the effect sometimes is binding between the test molecule and the target molecule, and sometimes is an observable change in cells, tissue, or organism.

[0146] There are many standard methods for detecting the presence or absence of interaction between a test molecule and a target molecule. For example, titrametric, acidimetric, radiometric, NMR, monolayer, polarographic, spectrophotometric, fluorescent, and ESR assays probative of a target molecule interaction may be utilized. Examples of G protein-coupled receptor assays are known, for example, and are described in WO-0242461 and WO-04013285.

[0147] Test molecule/target molecule interactions can be detected and/or quantified using assays known in the art. For example, an interaction can be determined by labeling the test molecule and/or the target molecule, where the label is covalently or non-covalently attached to the test molecule or target molecule. The label is sometimes a radioactive molecule such as ^{125}I , ^{131}I , ^{35}S or ^3H , which can be detected by direct counting of radioemission or by scintillation counting. Also, enzymatic labels such as horseradish peroxidase, alkaline phosphatase, or luciferase may be utilized where the enzymatic label can be detected by determining conversion of an appropriate substrate to product. In addition, presence or absence of an interaction can be determined without labeling. For example, a microphysiometer (*e.g.*, Cytosensor) is an analytical instrument that measures the rate at which a cell acidifies its environment using a light-addressable potentiometric sensor (LAPS). Changes in this acidification rate can be used as an indication of an interaction between a test molecule and target molecule (McConnell, H. M. *et al.*, *Science* 257: 1906-1912 (1992)).

[0148] In cell-based systems, cells typically include a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4* or *GPR50* nucleic acid, an encoded polypeptide, or substantially identical nucleic acid or polypeptide thereof, and are often of mammalian origin, although the cell can be of any origin. Whole cells, cell homogenates, and cell fractions (*e.g.*, cell membrane fractions) can be subjected to analysis. Where interactions between a test molecule with a target polypeptide are monitored, soluble and/or membrane bound forms of the polypeptide may be utilized. Where membrane-bound forms of the polypeptide are used, it may be desirable to utilize a solubilizing agent. Examples of such solubilizing agents include non-ionic detergents such as n-octylglucoside, n-dodecylglucoside, n-dodecylmaltoiside, octanoyl-N-methylglucamide, decanoyl-N-methylglucamide, Triton® X-100, Triton® X-114, Thesit®, Isotridecylpoly(ethylene glycol ether)_n, 3-[(3-cholamidopropyl)dimethylamminio]-1-propane sulfonate (CHAPS), 3-[(3-cholamidopropyl)dimethylamminio]-2-hydroxy-1-propane sulfonate (CHAPSO), or N-dodecyl-N,N-dimethyl-3-ammonio-1-propane sulfonate.

[0149] An interaction between a test molecule and target molecule also can be detected by monitoring fluorescence energy transfer (FET) (*see, e.g.*, Lakowicz *et al.*, U.S. Patent No. 5,631,169; Stavrianopoulos *et al.* U.S. Patent No. 4,868,103). A fluorophore label on a first, "donor" molecule is selected such that its emitted fluorescent energy will be absorbed by a fluorescent label on a second,

“acceptor” molecule, which in turn is able to fluoresce due to the absorbed energy. Alternately, the “donor” polypeptide molecule may simply utilize the natural fluorescent energy of tryptophan residues. Labels are chosen that emit different wavelengths of light, such that the “acceptor” molecule label may be differentiated from that of the “donor”. Since the efficiency of energy transfer between the labels is related to the distance separating the molecules, the spatial relationship between the molecules can be assessed. In a situation in which binding occurs between the molecules, the fluorescent emission of the “acceptor” molecule label in the assay should be maximal. An FET binding event can be conveniently measured through standard fluorometric detection means well known in the art (*e.g.*, using a fluorimeter).

[0150] In another embodiment, determining the presence or absence of an interaction between a test molecule and a target molecule can be effected by monitoring surface plasmon resonance (*see, e.g.*, Sjolander & Urbanicz, *Anal. Chem.* 63: 2338-2345 (1991) and Szabo *et al.*, *Curr. Opin. Struct. Biol.* 5: 699-705 (1995)). “Surface plasmon resonance” or “biomolecular interaction analysis (BIA)” can be utilized to detect biospecific interactions in real time, without labeling any of the interactants (*e.g.*, BIAcore). Changes in the mass at the binding surface (indicative of a binding event) result in alterations of the refractive index of light near the surface (the optical phenomenon of surface plasmon resonance (SPR)), resulting in a detectable signal which can be used as an indication of real-time reactions between biological molecules.

[0151] In another embodiment, the target molecule or test molecules are anchored to a solid phase, facilitating the detection of target molecule/test molecule complexes and separation of the complexes from free, uncomplexed molecules. The target molecule or test molecule is immobilized to the solid support. In an embodiment, the target molecule is anchored to a solid surface, and the test molecule, which is not anchored, can be labeled, either directly or indirectly, with detectable labels discussed herein.

[0152] It may be desirable to immobilize a target molecule, an anti-target molecule antibody, and/or test molecules to facilitate separation of target molecule/test molecule complexes from uncomplexed forms, as well as to accommodate automation of the assay. The attachment between a test molecule and/or target molecule and the solid support may be covalent or non-covalent (*see, e.g.*, U.S. Patent No. 6,022,688 for non-covalent attachments). The solid support may be one or more surfaces of the system, such as one or more surfaces in each well of a microtiter plate, a surface of a silicon wafer, a surface of a bead (*see, e.g.*, Lam, *Nature* 354: 82-84 (1991)) that is optionally linked to another solid support, or a channel in a microfluidic device, for example. Types of solid supports, linker molecules for covalent and non-covalent attachments to solid supports, and methods for immobilizing nucleic acids and other molecules to solid supports are well known (*see, e.g.*, U.S. Patent Nos. 6,261,776; 5,900,481; 6,133,436; and 6,022,688; and WIPO publication WO 01/18234).

[0153] In an embodiment, target molecule may be immobilized to surfaces via biotin and streptavidin. For example, biotinylated target polypeptide can be prepared from biotin-NHS (N-hydroxy-succinimide) using techniques known in the art (*e.g.*, biotinylation kit, Pierce Chemicals, Rockford, IL), and immobilized in the wells of streptavidin-coated 96 well plates (Pierce Chemical). In another embodiment, a target polypeptide can be prepared as a fusion polypeptide. For example, glutathione-S-transferase/target polypeptide fusion can be adsorbed onto glutathione sepharose beads (Sigma Chemical, St. Louis, MO) or glutathione derivitized microtiter plates, which are then combined with a test molecule under conditions conducive to complex formation (*e.g.*, at physiological conditions for salt and pH). Following incubation, the beads or microtiter plate wells are washed to remove any unbound components, or the matrix is immobilized in the case of beads, and complex formation is determined directly or indirectly as described above. Alternatively, the complexes can be dissociated from the matrix, and the level of target molecule binding or activity is determined using standard techniques.

[0154] In an embodiment, the non-immobilized component is added to the coated surface containing the anchored component. After the reaction is complete, unreacted components are removed (*e.g.*, by washing) under conditions such that a significant percentage of complexes formed will remain immobilized to the solid surface. The detection of complexes anchored on the solid surface can be accomplished in a number of manners. Where the previously non-immobilized component is pre-labeled, the detection of label immobilized on the surface indicates that complexes were formed. Where the previously non-immobilized component is not pre-labeled, an indirect label can be used to detect complexes anchored on the surface, *e.g.*, by adding a labeled antibody specific for the immobilized component, where the antibody, in turn, can be directly labeled or indirectly labeled with, *e.g.*, a labeled anti-Ig antibody.

[0155] In another embodiment, an assay is performed utilizing antibodies that specifically bind target molecule or test molecule but do not interfere with binding of the target molecule to the test molecule. Such antibodies can be derivitized to a solid support, and unbound target molecule may be immobilized by antibody conjugation. Methods for detecting such complexes, in addition to those described above for the GST-immobilized complexes, include immunodetection of complexes using antibodies reactive with the target molecule, as well as enzyme-linked assays which rely on detecting an enzymatic activity associated with the target molecule.

[0156] Cell free assays also can be conducted in a liquid phase. In such an assay, reaction products are separated from unreacted components, by any of a number of standard techniques, including but not limited to: differential centrifugation (*see, e.g.*, Rivas, G., and Minton, *Trends Biochem Sci Aug:18(8): 284-7 (1993)*); chromatography (gel filtration chromatography, ion-exchange chromatography); electrophoresis (*see, e.g.*, Ausubel *et al., eds. Current Protocols in Molecular Biology*, J. Wiley: New

York (1999)); and immunoprecipitation (*see, e.g., Ausubel et al., eds., supra*). Media and chromatographic techniques are known to one skilled in the art (*see, e.g., Heegaard, J. Mol. Recognit. Winter; 11(1-6): 141-8 (1998); Hage & Tweed, J. Chromatogr. B Biomed. Sci. Appl. Oct 10; 699 (1-2): 499-525 (1997)*). Further, fluorescence energy transfer may also be conveniently utilized, as described herein, to detect binding without further purification of the complex from solution.

[0157] In another embodiment, modulators of target molecule expression are identified. For example, a cell or cell free mixture is contacted with a candidate compound and the expression of target mRNA or target polypeptide is evaluated relative to the level of expression of target mRNA or target polypeptide in the absence of the candidate compound. When expression of target mRNA or target polypeptide is greater in the presence of the candidate compound than in its absence, the candidate compound is identified as an agonist of target mRNA or target polypeptide expression. Alternatively, when expression of target mRNA or target polypeptide is less (*e.g., less with statistical significance*) in the presence of the candidate compound than in its absence, the candidate compound is identified as an antagonist or inhibitor of target mRNA or target polypeptide expression. The level of target mRNA or target polypeptide expression can be determined by methods described herein.

[0158] In another embodiment, binding partners that interact with a target molecule are detected. The target molecules can interact with one or more cellular or extracellular macromolecules, such as polypeptides *in vivo*, and these interacting molecules are referred to herein as "binding partners." Binding partners can agonize or antagonize target molecule biological activity. Also, test molecules that agonize or antagonize interactions between target molecules and binding partners can be useful as therapeutic molecules as they can up-regulate or down-regulated target molecule activity *in vivo* and thereby treat osteoarthritis.

[0159] Binding partners of target molecules can be identified by methods known in the art. For example, binding partners may be identified by lysing cells and analyzing cell lysates by electrophoretic techniques. Alternatively, a two-hybrid assay or three-hybrid assay can be utilized (*see, e.g., U.S. Patent No. 5,283,317; Zervos et al., Cell 72:223-232 (1993); Madura et al., J. Biol. Chem. 268: 12046-12054 (1993); Bartel et al., Biotechniques 14: 920-924 (1993); Iwabuchi et al., Oncogene 8: 1693-1696 (1993); and Brent WO94/10300*). A two-hybrid system is based on the modular nature of most transcription factors, which consist of separable DNA-binding and activation domains. The assay often utilizes two different DNA constructs. In one construct, a *PADI2, APOB, IL1RL2, WASPIP, BVES, PELI2, LOXL1, CASPR4* or *GPR50* nucleic acid (sometimes referred to as the "bait") is fused to a gene encoding the DNA binding domain of a known transcription factor (*e.g., GAL-4*). In another construct, a DNA sequence from a library of DNA sequences that encodes a potential binding partner (sometimes referred to as the "prey") is fused to a gene that encodes an activation domain of the known transcription factor.

Sometimes, a *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXLI*, *CASPR4* or *GPR50* nucleic acid can be fused to the activation domain. If the “bait” and the “prey” molecules interact *in vivo*, the DNA-binding and activation domains of the transcription factor are brought into close proximity. This proximity allows transcription of a reporter gene (*e.g.*, LacZ) which is operably linked to a transcriptional regulatory site responsive to the transcription factor. Expression of the reporter gene can be detected and cell colonies containing the functional transcription factor can be isolated and used to identify the potential binding partner.

[0160] In an embodiment for identifying test molecules that antagonize or agonize complex formation between target molecules and binding partners, a reaction mixture containing the target molecule and the binding partner is prepared, under conditions and for a time sufficient to allow complex formation. The reaction mixture often is provided in the presence or absence of the test molecule. The test molecule can be included initially in the reaction mixture, or can be added at a time subsequent to the addition of the target molecule and its binding partner. Control reaction mixtures are incubated without the test molecule or with a placebo. Formation of any complexes between the target molecule and the binding partner then is detected. Decreased formation of a complex in the reaction mixture containing test molecule as compared to in a control reaction mixture indicates that the molecule antagonizes target molecule/binding partner complex formation. Alternatively, increased formation of a complex in the reaction mixture containing test molecule as compared to in a control reaction mixture indicates that the molecule agonizes target molecule/binding partner complex formation. In another embodiment, complex formation of target molecule/binding partner can be compared to complex formation of mutant target molecule/binding partner (*e.g.*, amino acid modifications in a target polypeptide). Such a comparison can be important in those cases where it is desirable to identify test molecules that modulate interactions of mutant but not non-mutated target gene products.

[0161] The assays can be conducted in a heterogeneous or homogeneous format. In heterogeneous assays, target molecule and/or the binding partner are immobilized to a solid phase, and complexes are detected on the solid phase at the end of the reaction. In homogeneous assays, the entire reaction is carried out in a liquid phase. In either approach, the order of addition of reactants can be varied to obtain different information about the molecules being tested. For example, test compounds that agonize target molecule/binding partner interactions can be identified by conducting the reaction in the presence of the test molecule in a competition format. Alternatively, test molecules that agonize preformed complexes, *e.g.*, molecules with higher binding constants that displace one of the components from the complex, can be tested by adding the test compound to the reaction mixture after complexes have been formed.

[0162] In a heterogeneous assay embodiment, the target molecule or the binding partner is anchored onto a solid surface (*e.g.*, a microtiter plate), while the non-anchored species is labeled, either directly or

indirectly. The anchored molecule can be immobilized by non-covalent or covalent attachments. Alternatively, an immobilized antibody specific for the molecule to be anchored can be used to anchor the molecule to the solid surface. The partner of the immobilized species is exposed to the coated surface with or without the test molecule. After the reaction is complete, unreacted components are removed (e.g., by washing) such that a significant portion of any complexes formed will remain immobilized on the solid surface. Where the non-immobilized species is pre-labeled, the detection of label immobilized on the surface is indicative of complex. Where the non-immobilized species is not pre-labeled, an indirect label can be used to detect complexes anchored to the surface; e.g., by using a labeled antibody specific for the initially non-immobilized species. Depending upon the order of addition of reaction components, test compounds that inhibit complex formation or that disrupt preformed complexes can be detected.

[0163] In another embodiment, the reaction can be conducted in a liquid phase in the presence or absence of test molecule, where the reaction products are separated from unreacted components, and the complexes are detected (e.g., using an immobilized antibody specific for one of the binding components to anchor any complexes formed in solution, and a labeled antibody specific for the other partner to detect anchored complexes). Again, depending upon the order of addition of reactants to the liquid phase, test compounds that inhibit complex or that disrupt preformed complexes can be identified.

[0164] In an alternate embodiment, a homogeneous assay can be utilized. For example, a preformed complex of the target gene product and the interactive cellular or extracellular binding partner product is prepared. One or both of the target molecule or binding partner is labeled, and the signal generated by the label(s) is quenched upon complex formation (e.g., U.S. Patent No. 4,109,496 that utilizes this approach for immunoassays). Addition of a test molecule that competes with and displaces one of the species from the preformed complex will result in the generation of a signal above background. In this way, test substances that disrupt target molecule/binding partner complexes can be identified.

[0165] Candidate therapeutics for treating osteoarthritis are identified from a group of test molecules that interact with a target molecule. Test molecules are normally ranked according to the degree to which they modulate (e.g., agonize or antagonize) a function associated with the target molecule (e.g., DNA replication and/or processing, RNA transcription and/or processing, polypeptide production and/or processing, and/or biological function/activity), and then top ranking modulators are selected. Also, pharmacogenomic information described herein can determine the rank of a modulator. The top 10% of ranked test molecules often are selected for further testing as candidate therapeutics, and sometimes the top 15%, 20%, or 25% of ranked test molecules are selected for further testing as candidate therapeutics. Candidate therapeutics typically are formulated for administration to a subject.

Therapeutic Formulations

[0166] Formulations and pharmaceutical compositions typically include in combination with a pharmaceutically acceptable carrier one or more target molecule modulators. The modulator often is a test molecule identified as having an interaction with a target molecule by a screening method described above. The modulator may be a compound, an antisense nucleic acid, a ribozyme, an antibody, or a binding partner. Also, formulations may comprise a target polypeptide or fragment thereof in combination with a pharmaceutically acceptable carrier.

[0167] As used herein, the term “pharmaceutically acceptable carrier” includes solvents, dispersion media, coatings, antibacterial and antifungal agents, isotonic and absorption delaying agents, and the like, compatible with pharmaceutical administration. Supplementary active compounds can also be incorporated into the compositions. Pharmaceutical compositions can be included in a container, pack, or dispenser together with instructions for administration.

[0168] A pharmaceutical composition typically is formulated to be compatible with its intended route of administration. Examples of routes of administration include parenteral, *e.g.*, intravenous, intradermal, subcutaneous, oral (*e.g.*, inhalation), transdermal (topical), transmucosal, and rectal administration. Solutions or suspensions used for parenteral, intradermal, or subcutaneous application can include the following components: a sterile diluent such as water for injection, saline solution, fixed oils, polyethylene glycols, glycerin, propylene glycol or other synthetic solvents; antibacterial agents such as benzyl alcohol or methyl parabens; antioxidants such as ascorbic acid or sodium bisulfite; chelating agents such as ethylenediaminetetraacetic acid; buffers such as acetates, citrates or phosphates and agents for the adjustment of tonicity such as sodium chloride or dextrose. pH can be adjusted with acids or bases, such as hydrochloric acid or sodium hydroxide. The parenteral preparation can be enclosed in ampoules, disposable syringes or multiple dose vials made of glass or plastic.

[0169] Oral compositions generally include an inert diluent or an edible carrier. For the purpose of oral therapeutic administration, the active compound can be incorporated with excipients and used in the form of tablets, troches, or capsules, *e.g.*, gelatin capsules. Oral compositions can also be prepared using a fluid carrier for use as a mouthwash. Pharmaceutically compatible binding agents, and/or adjuvant materials can be included as part of the composition. The tablets, pills, capsules, troches and the like can contain any of the following ingredients, or compounds of a similar nature: a binder such as microcrystalline cellulose, gum tragacanth or gelatin; an excipient such as starch or lactose, a disintegrating agent such as alginic acid, Primogel, or corn starch; a lubricant such as magnesium stearate or Sterotes; a glidant such as colloidal silicon dioxide; a sweetening agent such as sucrose or saccharin; or a flavoring agent such as peppermint, methyl salicylate, or orange flavoring.

[0170] Pharmaceutical compositions suitable for injectable use include sterile aqueous solutions (where water soluble) or dispersions and sterile powders for the extemporaneous preparation of sterile injectable solutions or dispersion. For intravenous administration, suitable carriers include physiological saline, bacteriostatic water, Cremophor EL™ (BASF, Parsippany, NJ) or phosphate buffered saline (PBS). In all cases, the composition must be sterile and should be fluid to the extent that easy syringability exists. It should be stable under the conditions of manufacture and storage and must be preserved against the contaminating action of microorganisms such as bacteria and fungi. The carrier can be a solvent or dispersion medium containing, for example, water, ethanol, polyol (for example, glycerol, propylene glycol, and liquid polyethylene glycol, and the like), and suitable mixtures thereof. The proper fluidity can be maintained, for example, by the use of a coating such as lecithin, by the maintenance of the required particle size in the case of dispersion and by the use of surfactants. Prevention of the action of microorganisms can be achieved by various antibacterial and antifungal agents, for example, parabens, chlorobutanol, phenol, ascorbic acid, thimerosal, and the like. In many cases, it will be preferable to include isotonic agents, for example, sugars, polyalcohols such as mannitol, sorbitol, sodium chloride in the composition. Prolonged absorption of the injectable compositions can be brought about by including in the composition an agent which delays absorption, for example, aluminum monostearate and gelatin.

[0171] Sterile injectable solutions can be prepared by incorporating the active compound in the required amount in an appropriate solvent with one or a combination of ingredients enumerated above, as required, followed by filtered sterilization. Generally, dispersions are prepared by incorporating the active compound into a sterile vehicle which contains a basic dispersion medium and the required other ingredients from those enumerated above. In the case of sterile powders for the preparation of sterile injectable solutions, the preferred methods of preparation are vacuum drying and freeze-drying which yields a powder of the active ingredient plus any additional desired ingredient from a previously sterile-filtered solution thereof.

[0172] For administration by inhalation, the compounds are delivered in the form of an aerosol spray from pressured container or dispenser which contains a suitable propellant, e.g., a gas such as carbon dioxide, or a nebulizer.

[0173] Systemic administration can also be by transmucosal or transdermal means. For transmucosal or transdermal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art, and include, for example, for transmucosal administration, detergents, bile salts, and fusidic acid derivatives. Transmucosal administration can be accomplished through the use of nasal sprays or suppositories. For transdermal administration, the active compounds are formulated into ointments, salves, gels, or creams as generally

known in the art. Molecules can also be prepared in the form of suppositories (*e.g.*, with conventional suppository bases such as cocoa butter and other glycerides) or retention enemas for rectal delivery.

[0174] In one embodiment, active molecules are prepared with carriers that will protect the compound against rapid elimination from the body, such as a controlled release formulation, including implants and microencapsulated delivery systems. Biodegradable, biocompatible polymers can be used, such as ethylene vinyl acetate, polyanhydrides, polyglycolic acid, collagen, polyorthoesters, and polylactic acid. Methods for preparation of such formulations will be apparent to those skilled in the art. Materials can also be obtained commercially from Alza Corporation and Nova Pharmaceuticals, Inc. Liposomal suspensions (including liposomes targeted to infected cells with monoclonal antibodies to viral antigens) can also be used as pharmaceutically acceptable carriers. These can be prepared according to methods known to those skilled in the art, for example, as described in U.S. Patent No. 4,522,811.

[0175] It is advantageous to formulate oral or parenteral compositions in dosage unit form for ease of administration and uniformity of dosage. Dosage unit form as used herein refers to physically discrete units suited as unitary dosages for the subject to be treated; each unit containing a predetermined quantity of active compound calculated to produce the desired therapeutic effect in association with the required pharmaceutical carrier.

[0176] Toxicity and therapeutic efficacy of such compounds can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g.*, for determining the LD₅₀ (the dose lethal to 50% of the population) and the ED₅₀ (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio LD₅₀/ED₅₀. Molecules which exhibit high therapeutic indices are preferred. While molecules that exhibit toxic side effects may be used, care should be taken to design a delivery system that targets such compounds to the site of affected tissue in order to minimize potential damage to uninfected cells and, thereby, reduce side effects.

[0177] The data obtained from the cell culture assays and animal studies can be used in formulating a range of dosage for use in humans. The dosage of such molecules lies preferably within a range of circulating concentrations that include the ED₅₀ with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilized. For any molecules used in the methods described herein, the therapeutically effective dose can be estimated initially from cell culture assays. A dose may be formulated in animal models to achieve a circulating plasma concentration range that includes the IC₅₀ (*i.e.*, the concentration of the test compound which achieves a half-maximal inhibition of symptoms) as determined in cell culture. Such information can be

used to more accurately determine useful doses in humans. Levels in plasma may be measured, for example, by high performance liquid chromatography.

[0178] As defined herein, a therapeutically effective amount of protein or polypeptide (*i.e.*, an effective dosage) ranges from about 0.001 to 30 mg/kg body weight, sometimes about 0.01 to 25 mg/kg body weight, often about 0.1 to 20 mg/kg body weight, and more often about 1 to 10 mg/kg, 2 to 9 mg/kg, 3 to 8 mg/kg, 4 to 7 mg/kg, or 5 to 6 mg/kg body weight. The protein or polypeptide can be administered one time per week for between about 1 to 10 weeks, sometimes between 2 to 8 weeks, often between about 3 to 7 weeks, and more often for about 4, 5, or 6 weeks. The skilled artisan will appreciate that certain factors may influence the dosage and timing required to effectively treat a subject, including but not limited to the severity of the disease or disorder, previous treatments, the general health and/or age of the subject, and other diseases present. Moreover, treatment of a subject with a therapeutically effective amount of a protein, polypeptide, or antibody can include a single treatment or, preferably, can include a series of treatments.

[0179] With regard to polypeptide formulations, featured herein is a method for treating osteoarthritis in a subject, which comprises contacting one or more cells in the subject with a first polypeptide, where the subject comprises a second polypeptide having one or more polymorphic variations associated with cancer, and where the first polypeptide comprises fewer polymorphic variations associated with cancer than the second polypeptide. The first and second polypeptides are encoded by a nucleic acid which comprises a nucleotide sequence in SEQ ID NO: 1-17; a nucleotide sequence which encodes a polypeptide consisting of an amino acid sequence encoded by a nucleotide sequence referenced in SEQ ID NO: 1-17; a nucleotide sequence which encodes a polypeptide that is 90% or more identical to an amino acid sequence encoded by a nucleotide sequence of SEQ ID NO: 1-17 and a nucleotide sequence 90% or more identical to a nucleotide sequence in SEQ ID NO: 1-17. The subject often is a human.

[0180] For antibodies, a dosage of 0.1 mg/kg of body weight (generally 10 mg/kg to 20 mg/kg) is often utilized. If the antibody is to act in the brain, a dosage of 50 mg/kg to 100 mg/kg is often appropriate. Generally, partially human antibodies and fully human antibodies have a longer half-life within the human body than other antibodies. Accordingly, lower dosages and less frequent administration is often possible. Modifications such as lipidation can be used to stabilize antibodies and to enhance uptake and tissue penetration (*e.g.*, into the brain). A method for lipidation of antibodies is described by Cruikshank *et al.*, *J. Acquired Immune Deficiency Syndromes and Human Retrovirology* 14:193 (1997).

[0181] Antibody conjugates can be used for modifying a given biological response, the drug moiety is not to be construed as limited to classical chemical therapeutic agents. For example, the drug moiety

may be a protein or polypeptide possessing a desired biological activity. Such proteins may include, for example, a toxin such as abrin, ricin A, pseudomonas exotoxin, or diphtheria toxin; a polypeptide such as tumor necrosis factor, alpha-interferon, beta-interferon, nerve growth factor, platelet derived growth factor, tissue plasminogen activator; or, biological response modifiers such as, for example, lymphokines, interleukin-1 ("IL-1"), interleukin-2 ("IL-2"), interleukin-6 ("IL-6"), granulocyte macrophage colony stimulating factor ("GM-CSF"), granulocyte colony stimulating factor ("G-CSF"), or other growth factors. Alternatively, an antibody can be conjugated to a second antibody to form an antibody heteroconjugate as described by Segal in U.S. Patent No. 4,676,980.

[0182] For compounds, exemplary doses include milligram or microgram amounts of the compound per kilogram of subject or sample weight, for example, about 1 microgram per kilogram to about 500 milligrams per kilogram, about 100 micrograms per kilogram to about 5 milligrams per kilogram, or about 1 microgram per kilogram to about 50 micrograms per kilogram. It is understood that appropriate doses of a small molecule depend upon the potency of the small molecule with respect to the expression or activity to be modulated. When one or more of these small molecules is to be administered to an animal (e.g., a human) in order to modulate expression or activity of a polypeptide or nucleic acid described herein, a physician, veterinarian, or researcher may, for example, prescribe a relatively low dose at first, subsequently increasing the dose until an appropriate response is obtained. In addition, it is understood that the specific dose level for any particular animal subject will depend upon a variety of factors including the activity of the specific compound employed, the age, body weight, general health, gender, and diet of the subject, the time of administration, the route of administration, the rate of excretion, any drug combination, and the degree of expression or activity to be modulated.

[0183] With regard to nucleic acid formulations, gene therapy vectors can be delivered to a subject by, for example, intravenous injection, local administration (*see, e.g.*, U.S. Patent 5,328,470) or by stereotactic injection (*see e.g.*, Chen *et al.*, (1994) *Proc. Natl. Acad. Sci. USA* 91:3054-3057). Pharmaceutical preparations of gene therapy vectors can include a gene therapy vector in an acceptable diluent, or can comprise a slow release matrix in which the gene delivery vehicle is imbedded. Alternatively, where the complete gene delivery vector can be produced intact from recombinant cells (e.g., retroviral vectors) the pharmaceutical preparation can include one or more cells which produce the gene delivery system. Examples of gene delivery vectors are described herein.

Therapeutic Methods

[0184] A therapeutic formulation described above can be administered to a subject in need of a therapeutic for inducing a desired biological response.. Therapeutic formulations can be administered by any of the paths described herein. With regard to both prophylactic and therapeutic methods of

treatment, such treatments may be specifically tailored or modified, based on knowledge obtained from pharmacogenomic analyses described herein.

[0185] As used herein, the term “treatment” is defined as the application or administration of a therapeutic formulation to a subject, or application or administration of a therapeutic agent to an isolated tissue or cell line from a subject with the purpose to cure, heal, alleviate, relieve, alter, remedy, ameliorate, improve or affect osteoarthritis, symptoms of osteoarthritis or a predisposition towards osteoarthritis. A therapeutic formulation includes, but is not limited to, small molecules, peptides, antibodies, ribozymes and antisense oligonucleotides. Administration of a therapeutic formulation can occur prior to the manifestation of symptoms characteristic of osteoarthritis, such that osteoarthritis is prevented or delayed in its progression. The appropriate therapeutic composition can be determined based on screening assays described herein.

[0186] As discussed, successful treatment of osteoarthritis can be brought about by techniques that serve to agonize target molecule expression or function, or alternatively, antagonize target molecule expression or function. These techniques include administration of modulators that include, but are not limited to, small organic or inorganic molecules; antibodies (including, for example, polyclonal, monoclonal, humanized, anti-idiotypic, chimeric or single chain antibodies, and Fab, F(ab')₂ and Fab expression library fragments, scFV molecules, and epitope-binding fragments thereof); and peptides, phosphopeptides, or polypeptides.

[0187] Further, antisense and ribozyme molecules that inhibit expression of the target gene can also be used to reduce the level of target gene expression, thus effectively reducing the level of target gene activity. Still further, triple helix molecules can be utilized in reducing the level of target gene activity. Antisense, ribozyme and triple helix molecules are discussed above. It is possible that the use of antisense, ribozyme, and/or triple helix molecules to reduce or inhibit mutant gene expression can also reduce or inhibit the transcription (triple helix) and/or translation (antisense, ribozyme) of mRNA produced by normal target gene alleles, such that the concentration of normal target gene product present can be lower than is necessary for a normal phenotype. In such cases, nucleic acid molecules that encode and express target gene polypeptides exhibiting normal target gene activity can be introduced into cells via gene therapy method. Alternatively, in instances in that the target gene encodes an extracellular polypeptide, it can be preferable to co-administer normal target gene polypeptide into the cell or tissue in order to maintain the requisite level of cellular or tissue target gene activity.

[0188] Another method by which nucleic acid molecules may be utilized in treating or preventing osteoarthritis is use of aptamer molecules specific for target molecules. Aptamers are nucleic acid molecules having a tertiary structure which permits them to specifically bind to ligands (*see, e.g.,*

Osborne, *et al.*, *Curr. Opin. Chem. Biol.* 1(1): 5-9 (1997); and Patel, D. J., *Curr. Opin. Chem. Biol.* Jun; 1(1): 32-46 (1997)).

[0189] Yet another method of utilizing nucleic acid molecules for osteoarthritis treatment is gene therapy, which can also be referred to as allele therapy. Provided herein is a gene therapy method for treating osteoarthritis in a subject, which comprises contacting one or more cells in the subject or from the subject with a nucleic acid having a first nucleotide sequence (e.g., the first nucleotide sequence is identical to or substantially identical to a nucleotide sequence of SEQ ID NO: 1-17). Genomic DNA in the subject comprises a second nucleotide sequence having one or more polymorphic variations associated with osteoarthritis (e.g., the second nucleotide sequence is identical to or substantially identical to a nucleotide sequence of SEQ ID NO: 1-6). The first and second nucleotide sequences typically are substantially identical to one another, and the first nucleotide sequence comprises fewer polymorphic variations associated with osteoarthritis than the second nucleotide sequence. The first nucleotide sequence may comprise a gene sequence that encodes a full-length polypeptide or a fragment thereof. The subject is often a human. Allele therapy methods often are utilized in conjunction with a method of first determining whether a subject has genomic DNA that includes polymorphic variants associated with osteoarthritis.

[0190] In another allele therapy embodiment, provided herein is a method which comprises contacting one or more cells in the subject or from the subject with a polypeptide encoded by a nucleic acid having a first nucleotide sequence (e.g., the first nucleotide sequence is identical to or substantially identical to the nucleotide sequence of SEQ ID NO: 1-17). Genomic DNA in the subject comprises a second nucleotide sequence having one or more polymorphic variations associated with osteoarthritis (e.g., the second nucleotide sequence is identical to or substantially identical to a nucleotide sequence of SEQ ID NO: 1-6). The first and second nucleotide sequences typically are substantially identical to one another, and the first nucleotide sequence comprises fewer polymorphic variations associated with osteoarthritis than the second nucleotide sequence. The first nucleotide sequence may comprise a gene sequence that encodes a full-length polypeptide or a fragment thereof. The subject is often a human.

[0191] For antibody-based therapies, antibodies can be generated that are both specific for target molecules and that reduce target molecule activity. Such antibodies may be administered in instances where antagonizing a target molecule function is appropriate for the treatment of osteoarthritis.

[0192] In circumstances where stimulating antibody production in an animal or a human subject by injection with a target molecule is harmful to the subject, it is possible to generate an immune response against the target molecule by use of anti-idiotypic antibodies (*see, e.g., Herlyn, Ann. Med.*; 31(1): 66-78 (1999); and Bhattacharya-Chatterjee & Foon, *Cancer Treat. Res.*; 94: 51-68 (1998)). Introducing an anti-idiotypic antibody to a mammal or human subject often stimulates production of anti-anti-idiotypic

antibodies, which typically are specific to the target molecule. Vaccines directed to osteoarthritis also may be generated in this fashion.

[0193] In instances where the target molecule is intracellular and whole antibodies are used, internalizing antibodies may be preferred. Lipofectin or liposomes can be used to deliver the antibody or a fragment of the Fab region that binds to the target antigen into cells. Where fragments of the antibody are used, the smallest inhibitory fragment that binds to the target antigen is preferred. For example, peptides having an amino acid sequence corresponding to the Fv region of the antibody can be used. Alternatively, single chain neutralizing antibodies that bind to intracellular target antigens can also be administered. Such single chain antibodies can be administered, for example, by expressing nucleotide sequences encoding single-chain antibodies within the target cell population (*see, e.g., Marasco et al., Proc. Natl. Acad. Sci. USA 90: 7889-7893 (1993)*).

[0194] Modulators can be administered to a patient at therapeutically effective doses to treat osteoarthritis. A therapeutically effective dose refers to an amount of the modulator sufficient to result in amelioration of symptoms of osteoarthritis. Toxicity and therapeutic efficacy of modulators can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g., for* determining the LD₅₀ (the dose lethal to 50% of the population) and the ED₅₀ (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio LD₅₀/ED₅₀. Modulators that exhibit large therapeutic indices are preferred. While modulators that exhibit toxic side effects can be used, care should be taken to design a delivery system that targets such molecules to the site of affected tissue in order to minimize potential damage to uninfected cells, thereby reducing side effects.

[0195] Data obtained from cell culture assays and animal studies can be used in formulating a range of dosages for use in humans. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED₅₀ with little or no toxicity. The dosage can vary within this range depending upon the dosage form employed and the route of administration utilized. For any compound used in the methods described herein, the therapeutically effective dose can be estimated initially from cell culture assays. A dose can be formulated in animal models to achieve a circulating plasma concentration range that includes the IC₅₀ (*i.e., the concentration of the test compound that achieves a half-maximal inhibition of symptoms*) as determined in cell culture. Such information can be used to more accurately determine useful doses in humans. Levels in plasma can be measured, for example, by high performance liquid chromatography.

[0196] Another example of effective dose determination for an individual is the ability to directly assay levels of "free" and "bound" compound in the serum of the test subject. Such assays may utilize antibody mimics and/or "biosensors" that have been created through molecular imprinting techniques.

Molecules that modulate target molecule activity are used as a template, or “imprinting molecule”, to spatially organize polymerizable monomers prior to their polymerization with catalytic reagents. The subsequent removal of the imprinted molecule leaves a polymer matrix which contains a repeated “negative image” of the compound and is able to selectively rebind the molecule under biological assay conditions. A detailed review of this technique can be seen in Ansell *et al.*, *Current Opinion in Biotechnology* 7: 89-94 (1996) and in Shea, *Trends in Polymer Science* 2: 166-173 (1994). Such “imprinted” affinity matrixes are amenable to ligand-binding assays, whereby the immobilized monoclonal antibody component is replaced by an appropriately imprinted matrix. An example of the use of such matrixes in this way can be seen in Vlatakis, *et al.*, *Nature* 361: 645-647 (1993). Through the use of isotope-labeling, the “free” concentration of compound which modulates target molecule expression or activity readily can be monitored and used in calculations of IC₅₀. Such “imprinted” affinity matrixes can also be designed to include fluorescent groups whose photon-emitting properties measurably change upon local and selective binding of target compound. These changes readily can be assayed in real time using appropriate fiberoptic devices, in turn allowing the dose in a test subject to be quickly optimized based on its individual IC₅₀. An example of such a “biosensor” is discussed in Kriz *et al.*, *Analytical Chemistry* 67: 2142-2144 (1995).

[0197] The examples set forth below are intended to illustrate but not limit the invention.

Examples

[0198] In the following studies a group of subjects was selected according to specific parameters relating to osteoarthritis. Nucleic acid samples obtained from individuals in the study group were subjected to genetic analysis, which identified associations between osteoarthritis and polymorphisms in the following genes: *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4*, and *GPR50* (herein referred to as “targets”). The polymorphisms were genotyped again in two replication cohorts consisting of individuals selected for OA. In addition, SNPs proximal to the incident polymorphisms were identified and allelotyped in OA case and control pools. Methods are described for producing *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4*, and *GPR50* polypeptide and polypeptide variants thereof *in vitro* or *in vivo*; *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4*, and *GPR50* nucleic acids or polypeptides and variants thereof are utilized for screening test molecules for those that interact with *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4*, and *GPR50* molecules. Test molecules identified as interactors with *PADI2*, *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *PELI2*, *LOXL1*, *CASPR4*, and *GPR50* molecules and variants thereof are further screened *in vivo* to determine whether they treat osteoarthritis.

Example 1

Samples and Pooling Strategies

Sample Selection

[0199] Blood samples were collected from individuals diagnosed with knee osteoarthritis, which were referred to as case samples. Also, blood samples were collected from individuals not diagnosed with knee osteoarthritis as gender and age-matched controls. A database was created that listed all phenotypic trait information gathered from individuals for each case and control sample. Genomic DNA was extracted from each of the blood samples for genetic analyses.

DNA Extraction from Blood Samples

[0200] Six to ten milliliters of whole blood was transferred to a 50 ml tube containing 27 ml of red cell lysis solution (RCL). The tube was inverted until the contents were mixed. Each tube was incubated for 10 minutes at room temperature and inverted once during the incubation. The tubes were then centrifuged for 20 minutes at 3000 x g and the supernatant was carefully poured off. 100-200 µl of residual liquid was left in the tube and was pipetted repeatedly to resuspend the pellet in the residual supernatant. White cell lysis solution (WCL) was added to the tube and pipetted repeatedly until completely mixed. While no incubation was normally required, the solution was incubated at 37°C or room temperature if cell clumps were visible after mixing until the solution was homogeneous. 2 ml of protein precipitation was added to the cell lysate. The mixtures were vortexed vigorously at high speed for 20 sec to mix the protein precipitation solution uniformly with the cell lysate, and then centrifuged for 10 minutes at 3000 x g. The supernatant containing the DNA was then poured into a clean 15 ml tube, which contained 7 ml of 100% isopropanol. The samples were mixed by inverting the tubes gently until white threads of DNA were visible. Samples were centrifuged for 3 minutes at 2000 x g and the DNA was visible as a small white pellet. The supernatant was decanted and 5 ml of 70% ethanol was added to each tube. Each tube was inverted several times to wash the DNA pellet, and then centrifuged for 1 minute at 2000 x g. The ethanol was decanted and each tube was drained on clean absorbent paper. The DNA was dried in the tube by inversion for 10 minutes, and then 1000 µl of 1X TE was added. The size of each sample was estimated, and less TE buffer was added during the following DNA hydration step if the sample was smaller. The DNA was allowed to rehydrate overnight at room temperature, and DNA samples were stored at 2-8°C.

[0201] DNA was quantified by placing samples on a hematology mixer for at least 1 hour. DNA was serially diluted (typically 1:80, 1:160, 1:320, and 1:640 dilutions) so that it would be within the measurable range of standards. 125 µl of diluted DNA was transferred to a clear U-bottom microtitre

plate, and 125 μ l of 1X TE buffer was transferred into each well using a multichannel pipette. The DNA and 1X TE were mixed by repeated pipetting at least 15 times, and then the plates were sealed. 50 μ l of diluted DNA was added to wells A5-H12 of a black flat bottom microtitre plate. Standards were inverted six times to mix them, and then 50 μ l of 1X TE buffer was pipetted into well A1, 1000 ng/ml of standard was pipetted into well A2, 500 ng/ml of standard was pipetted into well A3, and 250 ng/ml of standard was pipetted into well A4. PicoGreen (Molecular Probes, Eugene, Oregon) was thawed and freshly diluted 1:200 according to the number of plates that were being measured. PicoGreen was vortexed and then 50 μ l was pipetted into all wells of the black plate with the diluted DNA. DNA and PicoGreen were mixed by pipetting repeatedly at least 10 times with the multichannel pipette. The plate was placed into a Fluoroskan Ascent Machine (microplate fluorometer produced by Labsystems) and the samples were allowed to incubate for 3 minutes before the machine was run using filter pairs 485 nm excitation and 538 nm emission wavelengths. Samples having measured DNA concentrations of greater than 450 ng/ μ l were re-measured for conformation. Samples having measured DNA concentrations of 20 ng/ μ l or less were re-measured for confirmation.

Pooling Strategies – Discovery Cohort

[0202] Samples were derived from the Nottingham knee OA family study (UK) where index cases were identified through a knee replacement registry. Siblings were approached and assessed with knee x-rays and assigned status as affected or unaffected. In all 1,157 individuals were available. In order to create same-sex pools of appropriate sizes, 335 unrelated female individuals with OA from the Nottingham OA sample were selected for the case pool. The control pool was made up of unrelated female individuals from the St. Thomas twin study (England) with normal knee x-rays and without other indications of OA, regardless of anatomical location, as well as lacking family history of OA. The St. Thomas twin study consists of Caucasian, female participants from the St. Thomas' Hospital, London, adult-twin registry, which is a voluntary registry of >4,000 twin pairs ranging from 18 to 76 years of age. The female case samples and female control samples are described further in Table 1 below.

[0203] A select set of samples from each group were utilized to generate pools, and one pool was created for each group. Each individual sample in a pool was represented by an equal amount of genomic DNA. For example, where 25 ng of genomic DNA was utilized in each PCR reaction and there were 200 individuals in each pool, each individual would provide 125 pg of genomic DNA. Inclusion or exclusion of samples for a pool was based upon the following criteria: the sample was derived from an individual characterized as Caucasian; the sample was derived from an individual of British paternal and maternal descent; case samples were derived from individuals diagnosed with specific knee osteoarthritis

(OA) and were recruited from an OA knee replacement clinic. Control samples were derived from individuals free of OA, family history of OA, and rheumatoid arthritis. Also, sufficient genomic DNA was extracted from each blood sample for all allelotyping and genotyping reactions performed during the study. Phenotype information from each individual was collected and included age of the individual, gender, family history of OA, general medical information (e.g., height, weight, thyroid disease, diabetes, psoriasis, hysterectomy), joint history (previous and current symptoms, joint-related operations, age at onset of symptoms, date of primary diagnosis, age of individual as of primary diagnosis and order of involvement), and knee-related findings (crepitus, restricted passive movement, bony swelling/deformity). Additional knee information included knee history, current symptoms, any major knee injury, meniscectomy, knee replacement surgery, age of surgery, and treatment history (including hormone replace therapy (HRT)). Samples that met these criteria were added to appropriate pools based on disease status.

[0204] The selection process yielded the pools set forth in Table 1, which were used in the studies that follow:

TABLE 1

	Female case	Female control
Pool size (Number)	335	335
Pool Criteria (ex: case/control)	control	case
Mean Age (ex: years)	57.21	69.95

Example 2

Association of Polymorphic Variants with Osteoarthritis

[0205] A whole-genome screen was performed to identify particular SNPs associated with occurrence of osteoarthritis. As described in Example 1, two sets of samples were utilized, which included samples from female individuals having knee osteoarthritis (osteoarthritis cases), and samples from female individuals not having knee osteoarthritis (female controls). The initial screen of each pool was performed in an allelotyping study, in which certain samples in each group were pooled. By pooling DNA from each group, an allele frequency for each SNP in each group was calculated. These allele frequencies were then compared to one another. Particular SNPs were considered as being associated with osteoarthritis when allele frequency differences calculated between case and control pools were statistically significant. SNP disease association results obtained from the allelotyping study were then validated by genotyping each associated SNP across all samples from each pool. The results of the

genotyping then were analyzed, allele frequencies for each group were calculated from the individual genotyping results, and a p-value was calculated to determine whether the case and control groups had statistically significant differences in allele frequencies for a particular SNP. When the genotyping results agreed with the original allelotyping results, the SNP disease association was considered validated at the genetic level.

SNP Panel Used for Genetic Analyses

[0206] A whole-genome SNP screen began with an initial screen of approximately 25,000 SNPs over each set of disease and control samples using a pooling approach. The pools studied in the screen are described in Example 1. The SNPs analyzed in this study were part of a set of 25,488 SNPs confirmed as being statistically polymorphic as each is characterized as having a minor allele frequency of greater than 10%. The SNPs in the set reside in genes or in close proximity to genes, and many reside in gene exons. Specifically, SNPs in the set are located in exons, introns, and within 5,000 base-pairs upstream of a transcription start site of a gene. In addition, SNPs were selected according to the following criteria: they are located in ESTs; they are located in Locuslink or Ensembl genes; and they are located in Genomatix promoter predictions. SNPs in the set were also selected on the basis of even spacing across the genome, as depicted in Table 2.

[0207] A case-control study design using a whole genome association strategy involving approximately 28,000 single nucleotide polymorphisms (SNPs) was employed. Approximately 25,000 SNPs were evenly spaced in gene-based regions of the human genome with a median inter-marker distance of about 40,000 base pairs. Additionally, approximately 3,000 SNPs causing amino acid substitutions in genes described in the literature as candidates for various diseases were used. The case-control study samples were of female Caucasian origin (British paternal and maternal descent) 670 individuals were equally distributed in two groups: female controls and female cases. The whole genome association approach was first conducted on 2 DNA pools representing the 2 groups. Significant markers were confirmed by individual genotyping.

TABLE 2

<u>General Statistics</u>		<u>Spacing Statistics</u>	
Total # of SNPs	25,488	Median	37,058 bp
# of Exonic SNPs	>4,335 (17%)	Minimum*	1,000 bp
# SNPs with refSNP ID	20,776 (81%)	Maximum*	3,000,000 bp
Gene Coverage	>10,000	Mean	122,412 bp
Chromosome Coverage	All	Std Deviation	373,325 bp
		<i>*Excludes outliers</i>	

Allelotyping and Genotyping Results

[0208] The genetic studies summarized above and described in more detail below identified allelic variants in the target genes that are associated with osteoarthritis.

Assay for Verifying, Allelotyping, and Genotyping SNPs

[0209] A MassARRAY™ system (Sequenom, Inc.) was utilized to perform SNP genotyping in a high-throughput fashion. This genotyping platform was complemented by a homogeneous, single-tube assay method (hME™ or homogeneous MassEXTEND™ (Sequenom, Inc.)) in which two genotyping primers anneal to and amplify a genomic target surrounding a polymorphic site of interest. A third primer (the MassEXTEND™ primer), which is complementary to the amplified target up to but not including the polymorphism, was then enzymatically extended one or a few bases through the polymorphic site and then terminated.

[0210] For each polymorphism, SpectroDESIGNER™ software (Sequenom, Inc.) was used to generate a set of PCR primers and a MassEXTEND™ primer which were used to genotype the polymorphism. Other primer design software could be used or one of ordinary skill in the art could manually design primers based on his or her knowledge of the relevant factors and considerations in designing such primers. Table 3 shows PCR primers and Table 4 shows extension primers used for analyzing polymorphisms. The initial PCR amplification reaction was performed in a 5 µl total volume containing 1X PCR buffer with 1.5 mM MgCl₂ (Qiagen), 200 µM each of dATP, dGTP, dCTP, dTTP (Gibco-BRL), 2.5 ng of genomic DNA, 0.1 units of HotStar DNA polymerase (Qiagen), and 200 nM each of forward and reverse PCR primers specific for the polymorphic region of interest.

TABLE 3: PCR Primers

SNP Reference	Forward PCR primer	Reverse PCR primer
rs910223	ACGTTGGATGACAGAGTGTCAAGGCTCAGA	ACGTTGGATGTGGTTTTCCAGTGTCTTAC
rs1367117	ACGTTGGATGTTGGTTTTCTTCAGCAAGGC	ACGTTGGATGAGCTTCATCCTGAAGACCAG
rs1024791	ACGTTGGATGGTGTAAAGGACATGCAGATAC	ACGTTGGATGAACAGAACCCAGGAGGTTGG
rs1465621	ACGTTGGATGTTCTCCTCCCATTTCTCTCTG	ACGTTGGATGGCGGGACTAGAAGTAGATTTC
rs1018810	ACGTTGGATGTGCTGCTCCCATTTCTCATG	ACGTTGGATGAAGGAGTAGAGACCTTGCTG
rs242392	ACGTTGGATGTGTTGGGCTGCTGTGGCTCT	ACGTTGGATGACCACTTCTCACGGTTACTG
rs8818	ACGTTGGATGAATCTCTCCCTTCCAAGC	ACGTTGGATGTCCCTGTGGTTTTTCATCCAC
rs1395486	ACGTTGGATGCTCATTTATTTTCATGTTCAC	ACGTTGGATGTGCTGGAATAATGATTGTG
rs512294	ACGTTGGATGTCTTGTACCCACCTCCGAG	ACGTTGGATGAGAGCTCATGAGGGAATGG

[0211] Samples were incubated at 95°C for 15 minutes, followed by 45 cycles of 95°C for 20 seconds, 56°C for 30 seconds, and 72°C for 1 minute, finishing with a 3 minute final extension at 72°C.

Following amplification, shrimp alkaline phosphatase (SAP) (0.3 units in a 2 μ l volume) (Amersham Pharmacia) was added to each reaction (total reaction volume was 7 μ l) to remove any residual dNTPs that were not consumed in the PCR step. Samples were incubated for 20 minutes at 37°C, followed by 5 minutes at 85°C to denature the SAP.

[0212] Once the SAP reaction was complete, a primer extension reaction was initiated by adding a polymorphism-specific MassEXTEND™ primer cocktail to each sample. Each MassEXTEND™ cocktail included a specific combination of dideoxynucleotides (ddNTPs) and deoxynucleotides (dNTPs) used to distinguish polymorphic alleles from one another. Methods for verifying, allelotyping and genotyping SNPs are disclosed, for example, in U.S. Pat. No. 6,258,538, the content of which is hereby incorporated by reference. In Table 4, ddNTPs are shown and the fourth nucleotide not shown is the dNTP.

TABLE 4: Extension Primers

SNP Reference	Extend Probe	Termination Mix
rs910223	GGGCTGCACTGGTCCCA	ACT
rs1367117	AGCCATACACCTCTTTGAGG	ACT
rs1024791	CTGGCTGATGTCAGAAAGCA	ACG
rs1465621	CCATTCTTCTGACATTGCGC	CGT
rs1018810	CTGCTTTTATACATGCCACAC	ACT
rs242392	CTGCTGTGGCTCTACTGGT	ACG
rs8818	AGCCCCAACCACAGGCA	ACT
rs1395486	TTTCATGTTCAAAAAATCTTCT	ACG
rs512294	AGCTGGAGAGCAACCACC	ACT

[0213] The MassEXTEND™ reaction was performed in a total volume of 9 μ l, with the addition of 1X ThermoSequenase buffer, 0.576 units of ThermoSequenase (Amersham Pharmacia), 600 nM MassEXTEND™ primer, 2 mM of ddATP and/or ddCTP and/or ddGTP and/or ddTTP, and 2 mM of dATP or dCTP or dGTP or dTTP. The deoxy nucleotide (dNTP) used in the assay normally was complementary to the nucleotide at the polymorphic site in the amplicon. Samples were incubated at 94°C for 2 minutes, followed by 55 cycles of 5 seconds at 94°C, 5 seconds at 52°C, and 5 seconds at 72°C.

[0214] Following incubation, samples were desalted by adding 16 μ l of water (total reaction volume was 25 μ l), 3 mg of SpectroCLEAN™ sample cleaning beads (Sequenom, Inc.) and allowed to incubate for 3 minutes with rotation. Samples were then robotically dispensed using a piezoelectric dispensing device (SpectroJET™ (Sequenom, Inc.)) onto either 96-spot or 384-spot silicon chips containing a matrix

that crystallized each sample (SpectroCHIP™ (Sequenom, Inc.)). Subsequently, MALDI-TOF mass spectrometry (Biflex and Autoflex MALDI-TOF mass spectrometers (Bruker Daltonics) can be used) and SpectroTYPER RT™ software (Sequenom, Inc.) were used to analyze and interpret the SNP genotype for each sample.

Genetic Analysis

[0215] Minor allelic frequencies for the polymorphisms set forth in Table A were verified as being 10% or greater using the extension assay described above in a group of samples isolated from 92 individuals originating from the state of Utah in the United States, Venezuela and France (Coriell cell repositories).

[0216] Genotyping results are shown for female pools in Table 5. In Table 5, “AF” refers to allelic frequency; and “F case” and “F control” refer to female case and female control groups, respectively.

TABLE 5: Genotyping Results

SNP Reference	AF F case	AF F control	p-value
rs910223	A = 0.148 G = 0.852	A = 0.099 G = 0.901	0.0069
rs1367117	A = 0.339 G = 0.661	A = 0.402 G = 0.598	0.0181
rs1024791	G = 0.129 A = 0.871	G = 0.088 A = 0.912	0.0158
rs1465621	T = 0.071 A = 0.929	T = 0.107 A = 0.893	0.0194
rs1018810	A = 0.142 G = 0.858	A = 0.094 G = 0.906	0.0063
rs242392	C = 0.100 T = 0.900	C = 0.139 T = 0.861	0.0272
rs8818	G = 0.158 C = 0.842	G = 0.213 C = 0.787	0.0105
rs1395486	C = 0.115 T = 0.885	C = 0.158 T = 0.842	0.0231
rs512294	A = 0.078 G = 0.922	A = 0.124 G = 0.876	0.0054

[0217] All of the single marker alleles set forth in Table A were considered validated, since the genotyping data agreed with the allelotyping data and each SNP significantly associated with osteoarthritis. Particularly significant associations with osteoarthritis are indicated by a calculated p-value of less than 0.05 for genotyping results.

Example 3

Association of Polymorphic Variants with Osteoarthritis in Replication Cohorts

[0218] The single marker polymorphisms set forth in Table A were genotyped again in two replication cohorts consisting of individuals selected for OA.

Sample Selection and Pooling Strategies – Replication Sample 1

[0219] A second case control sample (replication sample #1) was created by using 100 Caucasian female cases from Chingford, UK, and 148 unrelated female cases from the St. Thomas twin study. Cases were defined as having Kellgren-Lawrence (KL) scores of at least 2 in at least one knee x-ray. In addition, 199 male knee replacement cases from Nottingham were included. (For a cohort description, see the Nottingham description provided in Example 1). The control pool was made up of unrelated female individuals from the St. Thomas twin study (England) with normal knee x-rays and without other indications of OA, regardless of anatomical location, as well as lacking family history of OA. The St. Thomas twin study consists of Caucasian, female participants from the St. Thomas' Hospital, London, adult-twin registry, which is a voluntary registry of >4,000 twin pairs ranging from 18 to 76 years of age. The replication sample 1 cohort was used to replicate the initial results. Table 6 below summarizes the selected phenotype data collected from the case and control individuals.

TABLE 6

Phenotype	Female cases (n=248):	Male cases (n=199):	Female controls (n=313):
	median (range)/ (n,%)	median (range)/ (n,%)	mean (range)/ (n,%)
Age	59 (39- 73)	66 (45- 73)	55 (50- 72)
Height (cm)	162 (141- 178)	175 (152- 198)	162 (141- 176)
Weight (kg)	68 (51- 123)	86 (62- 127)	64 (40- 111)
Body mass index (kg/m ²)	26 (18- 44)	29 (21- 41)	24 (18- 46)
Kellgren-Lawrence* left knee	0 (63, 26%), 1 (20, 8%), 2 (105, 43%), 3 (58, 23%), 4 (1, 0%)	NA	NA
Kellgren-Lawrence* right knee	0 (43, 7%), 1 (18, 7%), 2 (127, 52%), 3 (57, 23%), 4 (1, 0%)	NA	NA
KL* >2 both knees	No (145, 59%), Yes (101, 41%)	NA	NA
KL* >2 either knee	No (0, 0%), Yes (248, 100%)	NA	NA

* 0: normal, 1: doubtful, 2: definite osteophyte (bony protuberance), 3: joint space narrowing (with or without osteophyte), 4: joint deformity

Sample Selection and Pooling Strategies – Replication Sample 2

[0220] A third case control sample (replication sample #2) was created by using individuals with symptoms of OA from Newfoundland, Canada. These individuals were recruited and examined by rheumatologists. Affected joints were x-rayed and a final diagnosis of definite or probable OA was made according to American College of Rheumatology criteria by a single rheumatologist to avoid any inter-examiner diagnosis variability. Controls were recruited from volunteers without any symptoms from the musculoskeletal system based on a normal joint exam performed by a rheumatologist. Only cases with a diagnosis of definite OA were included in the study. Only individuals of Caucasian origin were included. The cases consisted of 228 individuals with definite knee OA, 106 individuals with definite hip OA, and 74 individuals with hip OA.

TABLE 7

Phenotype	Case	Control
Age at Visit	62.7	52.5
Sex (Female/Male)	227/119	174/101
Knee OA Xray: No	35% (120)	80% (16)
Unknown	1% (4)	0% (0)
Yes	64% (221)	20% (4)
Hip OA Xray: No	63% (215)	80% (16)
Unknown	2% (7)	0% (0)
Yes	35% (121)	20% (4)

Assay for Verifying, Allelotyping, and Genotyping SNPs

[0221] Genotyping of the replication cohorts described in Tables 6 and 7 was performed using the same methods used for the original genotyping, as described herein. A MassARRAY™ system (Sequenom, Inc.) was utilized to perform SNP genotyping in a high-throughput fashion. This genotyping platform was complemented by a homogeneous, single-tube assay method (hMET™ or homogeneous MassEXTEND™ (Sequenom, Inc.)) in which two genotyping primers anneal to and amplify a genomic target surrounding a polymorphic site of interest. A third primer (the MassEXTEND™ primer), which is complementary to the amplified target up to but not including the polymorphism, was then enzymatically extended one or a few bases through the polymorphic site and then terminated.

[0222] For each polymorphism, SpectroDESIGNER™ software (Sequenom, Inc.) was used to generate a set of PCR primers and a MassEXTEND™ primer which were used to genotype the polymorphism. Other primer design software could be used or one of ordinary skill in the art could manually design primers based on his or her knowledge of the relevant factors and considerations in designing such primers. Table 3 shows PCR primers and Table 4 shows extension probes used for analyzing (e.g., genotyping) polymorphisms in the replication cohorts. The initial PCR amplification reaction was performed in a 5 µl total volume containing 1X PCR buffer with 1.5 mM MgCl₂ (Qiagen), 200 µM each of dATP, dGTP, dCTP, dTTP (Gibco-BRL), 2.5 ng of genomic DNA, 0.1 units of HotStar DNA polymerase (Qiagen), and 200 nM each of forward and reverse PCR primers specific for the polymorphic region of interest.

[0223] Samples were incubated at 95°C for 15 minutes, followed by 45 cycles of 95°C for 20 seconds, 56°C for 30 seconds, and 72°C for 1 minute, finishing with a 3 minute final extension at 72°C. Following amplification, shrimp alkaline phosphatase (SAP) (0.3 units in a 2 µl volume) (Amersham Pharmacia) was added to each reaction (total reaction volume was 7 µl) to remove any residual dNTPs that were not consumed in the PCR step. Samples were incubated for 20 minutes at 37°C, followed by 5 minutes at 85°C to denature the SAP.

[0224] Once the SAP reaction was complete, a primer extension reaction was initiated by adding a polymorphism-specific MassEXTEND™ primer cocktail to each sample. Each MassEXTEND™ cocktail included a specific combination of dideoxynucleotides (ddNTPs) and deoxynucleotides (dNTPs) used to distinguish polymorphic alleles from one another. Methods for verifying, allelotyping and genotyping SNPs are disclosed, for example, in U.S. Pat. No. 6,258,538, the content of which is hereby incorporated by reference. In Table 7, ddNTPs are shown and the fourth nucleotide not shown is the dNTP.

[0225] The MassEXTEND™ reaction was performed in a total volume of 9 µl, with the addition of 1X ThermoSequenase buffer, 0.576 units of ThermoSequenase (Amersham Pharmacia), 600 nM MassEXTEND™ primer, 2 mM of ddATP and/or ddCTP and/or ddGTP and/or ddTTP, and 2 mM of dATP or dCTP or dGTP or dTTP. The deoxy nucleotide (dNTP) used in the assay normally was complementary to the nucleotide at the polymorphic site in the amplicon. Samples were incubated at 94°C for 2 minutes, followed by 55 cycles of 5 seconds at 94°C, 5 seconds at 52°C, and 5 seconds at 72°C.

[0226] Following incubation, samples were desalted by adding 16 µl of water (total reaction volume was 25 µl), 3 mg of SpectroCLEAN™ sample cleaning beads (Sequenom, Inc.) and allowed to incubate for 3 minutes with rotation. Samples were then robotically dispensed using a piezoelectric dispensing

device (SpectroJET™ (Sequenom, Inc.)) onto either 96-spot or 384-spot silicon chips containing a matrix that crystallized each sample (SpectroCHIP™ (Sequenom, Inc.)). Subsequently, MALDI-TOF mass spectrometry (Biflex and Autoflex MALDI-TOF mass spectrometers (Bruker Daltonics) can be used) and SpectroTYPER RT™ software (Sequenom, Inc.) were used to analyze and interpret the SNP genotype for each sample.

Genetic Analysis

[0227] Genotyping results for replication cohorts #1 and #2 are provided in Tables 8 and 9, respectively.

TABLE 8

rsID	Replication #1 (Mixed Male/Female cases and Female controls)				Meta-analysis Disc. + Rep #1
	AF OA Con	AF OA Cas	Delta	P-value	P-value
rs910223	0.87	0.86	0.01	0.650	0.1800
rs1367117	0.67	0.64	0.03	0.182	0.9900
rs1024791	0.87	0.87	-0.01	0.718	0.5900
rs1465621	0.89	0.91	-0.02	0.209	0.0095
rs1018810	0.91	0.89	0.02	0.289	0.0062
rs242392	0.87	0.87	0.00	0.927	0.2400
rs8818	0.78	0.81	-0.03	0.259	0.0150
rs1395486	0.87	0.88	-0.01	0.492	0.0390
rs512294	0.89	0.88	0.00	0.909	0.3600

TABLE 9

rsID	Replication #2 (Newfoundland) (Male/Female cases and controls)				Meta-analysis Disc. + Rep #2
	AF OA Con	AF OA Cas	Delta	P-value	Not Done
rs910223	0.86	0.86	0.001	0.974	
rs1367117	0.64	0.69	-0.049	0.081	
rs1024791	0.87	0.87	0.006	0.767	
rs1465621	0.92	0.92	0.003	0.837	
rs1018810					
rs242392	0.88	0.88	-0.005	0.813	
rs8818	0.85	0.82	0.034	0.127	
rs1395486	0.86	0.85	0.015	0.486	
rs512294	0.90	0.93	-0.037	0.021	

[0228] To combine the evidence for association from multiple sample collections, a meta-analysis procedure was employed. The allele frequencies were compared between cases and controls within the discovery sample, as well as within the replication cohort #1 using the DerSimonian-Laird approach (DerSimonian, R. and N. Laird. 1986. Meta-analysis in clinical trials. *Control Clin Trials* 7: 177-188.)

[0229] The absence of a statistically significant association in one or more of the replication cohorts should not be interpreted as minimizing the value of the original finding. There are many reasons why a biologically derived association identified in a sample from one population would not replicate in a sample from another population. The most important reason is differences in population history. Due to bottlenecks and founder effects, there may be common disease predisposing alleles present in one population that are relatively rare in another, leading to a lack of association in the candidate region. Also, because common diseases such as arthritis-related disorders are the result of susceptibilities in many genes and many environmental risk factors, differences in population-specific genetic and environmental backgrounds could mask the effects of a biologically relevant allele. For these and other reasons, statistically strong results in the original, discovery sample that did not replicate in one or more of the replication samples may be further evaluated in additional replication cohorts and experimental systems.

[0230] *APOB*, *IL1RL2*, *WASPIP*, *BVES*, *LOXL1* and *CASPR4* regions were analyzed further, as shown in the examples below. *PADI2*, described above, is a peptidyl arginine deiminase enzyme, type II, that converts arginine residues within proteins to citrulline residues. This gene is one of four known *PADI* genes that encode enzymes that catalyze conversion of arginine to citrulline in proteins. Individuals with rheumatoid arthritis (RA) frequently have autoantibodies to citrullinated peptides, suggesting the involvement of the peptidylarginine deiminases citrullinating enzymes in RA (van Venrooij et al., *Arthritis Res.*;2(4):249-51. Epub 2000 May 24).

[0231] Pellino homolog 2 from *Drosophila* (*PELI2*) is a member of the Pellino gene family, which are involved in Toll-like signalling pathways. Pellino-2 associates with the pelle-like kinase/IL-1R-associated kinase protein to couple the pelle-like kinase/IL-1R-associated kinase protein to IL-1- or LPS-dependent signaling. *PELI2* may act as a downstream effector of interleukin receptor signaling and may play a role in inflammation-mediated Osteoarthritis. Pathway members downstream of *PELI2* may be targetable (e.g., interleukin receptors).

[0232] G protein-coupled receptor 50 (*GPR50*) is a member of the G protein-coupled receptor family. *GPR50* has significant homology to melatonin receptors and was isolated by PCR of human genomic DNA with degenerate primers based on conserved regions of melatonin receptors.

Example 4

IL1RL2 Proximal SNPs

[0233] It has been discovered that rs1024791, which lies within the IL1RL2 gene, is associated with occurrence of osteoarthritis in subjects. Interleukin-1 receptor-like 2 is a member of the interleukin 1 receptor family. IL1RL2 inhibits IL-1 activity and contains immunoglobulin domains. An experiment with transient gene expression demonstrated that this receptor was incapable of binding to interleukin 1 alpha and interleukin 1 beta with high affinity. This gene and four other interleukin 1 receptor family genes, including interleukin 1 receptor, type I (IL1R1), interleukin 1 receptor, type II (IL1R2), interleukin 1 receptor-like 1 (IL1RL1), and interleukin 18 receptor 1 (IL18R1), form a cytokine receptor gene cluster in a region mapped to chromosome 2q12. IL1RL2 may mediate inflammatory responses that can contribute to the development of OA. IL1RL2 biological activity can be modulated by addition of an antibody, a recombinant binding partner, a binding agent, or a recombinant IL1RL2 protein or functional fragment thereof.

[0234] One hundred forty additional allelic variants proximal to rs1024791 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 10. The chromosome positions provided in column four of Table 10 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 10

dbSNP rs#	Chromosome	Position in SEQ ID NO: 2	Chromosome Position	Allele Variants
rs3917304	2	225	102409525	G/T
rs2041747	2	509	102409809	C/T
rs3917305	2	860	102410160	C/T
rs3771200	2	874	102410174	C/T
rs3917306	2	939	102410239	A/G
rs3917307	2	1483	102410783	G/T
rs3917308	2	1798	102411098	C/T
rs3917310	2	2189	102411489	A/T
rs3917311	2	2215	102411515	A/G
rs3917312	2	2282	102411582	C/G
rs3917313	2	2340	102411640	C/T
rs3917314	2	2963	102412263	A/C
rs3917316	2	3369	102412669	-T
rs3171845	2	3481	102412781	A/G
rs3171846	2	3564	102412864	G/T
rs3917317	2	3653	102412953	-T/C
rs3917318	2	4860	102414160	A/G
rs3917319	2	4941	102414241	A/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 2	Chromosome Position	Allele Variants
rs3917320	2	4975	102414275	A/C
rs3917321	2	5321	102414621	A/G
rs3917322	2	5346	102414646	A/G
rs3917323	2	5541	102414841	A/G
rs3917324	2	5633	102414933	C/G
rs3917325	2	6007	102415307	G/T
rs3732134	2	6317	102415617	C/G
rs3732133	2	6378	102415678	A/G
rs2110726	2	6382	102415682	C/T
rs3917326	2	6426	102415726	C/T
rs3917327	2	6479	102415779	C/G
rs3917328	2	6641	102415941	C/T
rs3732131	2	6703	102416003	C/T
rs3732130	2	6705	102416005	C/T
rs3917329	2	7963	102417263	G/T
rs3917330	2	8525	102417825	G/T
rs3917331	2	8526	102417826	A/T
rs3917344	2	8598	102417898	C/T
rs3917332	2	8624	102417924	A/T
rs3917333	2	8883	102418183	A/T
rs3917334	2	8980	102418280	G/T
rs1030021	2	13578	102422878	G/T
rs2241132	2	16135	102425435	G/T
rs2241131	2	16141	102425441	G/T
rs3835036	2	16642	102425942	-/TGG
rs1997504	2	16931	102426231	A/G
rs1805232	2	17004	102426304	A/G
rs1971696	2	17009	102426309	C/T
rs1971695	2	17010	102426310	A/G
rs3771199	2	18713	102428013	C/T
rs1922303	2	18853	102428153	C/T
rs3213734	2	20783	102430083	C/T
rs1997503	2	21335	102430635	A/G
rs1558649	2	22180	102431480	C/T
rs1558648	2	22268	102431568	A/C
rs1558647	2	22285	102431585	C/T
rs1558646	2	25378	102434678	C/T
rs1882514	2	25906	102435206	C/G
rs1882513	2	26015	102435315	A/G
rs867770	2	26475	102435775	A/G
rs2310235	2	26798	102436098	A/T
rs870684	2	27042	102436342	A/G
rs3771197	2	27649	102436949	A/G
rs3771196	2	27827	102437127	A/T
rs3821207	2	27873	102437173	A/G
rs3771195	2	28122	102437422	A/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 2	Chromosome Position	Allele Variants
rs3771194	2	28202	102437502	A/G
rs3771193	2	28232	102437532	A/C
rs3771192	2	28240	102437540	G/T
rs3755290	2	29546	102438846	G/T
rs3821206	2	29748	102439048	A/G
rs2302623	2	30054	102439354	A/T
rs3755289	2	30646	102439946	G/T
rs1922302	2	31149	102440449	A/C
rs2110725	2	36912	102446212	A/C
rs1465326	2	36936	102446236	C/G
rs2871458	2	37184	102446484	C/T
rs2080310	2	39064	102448364	C/T
rs1922289	2	39343	102448643	G/T
rs1922290	2	40868	102450168	C/G
rs1922291	2	40917	102450217	A/G
rs1922292	2	41113	102450413	A/C
rs3815517	2	47343	102456643	A/T
rs2241130	2	47806	102457106	A/G
rs1922295	2	47911	102457211	A/G
rs1922294	2	48009	102457309	C/T
rs2302622	2	48621	102457921	C/G
rs2310240	2	49245	102458545	C/G
rs1024792	2	49247	102458547	C/G
rs3836112	2	49299	102458599	-/CTCT
rs3074969	2	49302	102458602	-/AGAG
rs917994	2	49514	102458814	C/T
rs2041753	2	49626	102458926	G/T
rs2041752	2	49791	102459091	A/G
rs1024791	2	50010	102459310	A/G
rs1024790	2	50294	102459594	A/G
rs995515	2	51482	102460782	A/G/T
rs995514	2	51556	102460856	A/G
rs1922293	2	51855	102461155	A/G
rs3755287	2	51956	102461256	C/T
rs3729564	2	52155	102461455	A/G
rs3771188	2	52448	102461748	A/G
rs3771187	2	52458	102461758	C/T
rs3771186	2	52511	102461811	C/T
rs3771185	2	52607	102461907	A/G
rs2310241	2	54049	102463349	A/C
rs2302621	2	54224	102463524	A/C
rs2302620	2	54567	102463867	A/G
rs3771184	2	55052	102464352	C/T
rs3834161	2	55857	102465157	-/C
rs3755286	2	55941	102465241	C/G
rs3755285	2	56120	102465420	A/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 2	Chromosome Position	Allele Variants
rs1997502	2	56349	102465649	C/T
rs3771182	2	56727	102466027	A/G
rs3836111	2	57232	102466532	-/CT
rs3771181	2	58806	102468106	C/T
rs955754	2	61181	102470481	C/T
rs2302612	2	63808	102473108	A/G
rs3755284	2	64526	102473826	A/T
rs3821205	2	64865	102474165	A/G
rs3815511	2	64928	102474228	C/T
rs2287041	2	64966	102474266	A/C
rs2287040	2	65080	102474380	A/G
rs2287039	2	65090	102474990	C/T
rs3755283	2	66228	102475528	A/G
rs3755282	2	66982	102476282	A/G
rs1812326	2	72511	102481811	A/G
rs1558626	2	74170	102483470	A/T
rs1558625	2	74264	102483564	C/T
rs1558624	2	74333	102483633	C/T
rs1558623	2	74502	102483802	A/T
rs1035131	2	74741	102484041	A/C
rs2110661	2	75321	102484621	C/T
rs1420093	2	82558	102491858	A/G
rs3074971	2	85366	102494666	-/TTG
rs1345302	2	85469	102494769	C/T
rs1420092	2	86485	102495785	G/T
rs1345301	2	87687	102496987	C/T
rs2310242	2	89463	102498763	G/T
rs2310243	2	89660	102498960	A/G
rs1882510	2	95718	102505018	C/T
rs1882511	2	95821	102505121	A/G

Assay for Verifying and Allelotyping SNPs

[0235] The methods used to verify and allelotype the 140 proximal SNPs of Table 10 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 11 and Table 12, respectively.

TABLE 11

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs3917304	ACGTTGGATGCAGAGAAGATAAGGAATGAG	ACGTTGGATGAAGGAAAAATACCTAAACC
rs2041747	ACGTTGGATGGGGAAGACTATTACAGGTATG	ACGTTGGATGTAGGAGCAACTAACACTTGC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs3917305	ACGTTGGATGGTTGTGAAGGAGAGGTCATG	ACGTTGGATGCGAAAGCCTCTACTGGTTTC
rs3771200	ACGTTGGATGCTGCTTTCTACTGCTCATC	ACGTTGGATGAGTGCTTTGCAGGAGTGTGTG
rs3917306	ACGTTGGATGCACCTGCAAAAGCACTTTGTC	ACGTTGGATGTGCATTGTGTTCTCCATGGG
rs3917307	ACGTTGGATGCTGTAGTAAGATTCATGAC	ACGTTGGATGACCCAAGTAATGAGGAAGTG
rs3917308	ACGTTGGATGCAGTGACTTCTGATGTCCTC	ACGTTGGATGAAGTTAGGCTCTGGTACATTG
rs3917310	ACGTTGGATGGAGAACTAAATGGAAGG	ACGTTGGATGGGGAAGAACTGATATCTTCA
rs3917311	ACGTTGGATGCCATAGATTCAATTTGGGGAAG	ACGTTGGATGGGGAAGAACTAAATGGAAGG
rs3917312	ACGTTGGATGCCATACAAACACTGACTCTC	ACGTTGGATGGGAAGATATCAGTTCTTCCCC
rs3917313	ACGTTGGATGCACCATGACTATACCTGGTC	ACGTTGGATGTCAGTGTGTTGATGGGTGTG
rs3917314	ACGTTGGATGGGCTGCAATTCAGACAATAT	ACGTTGGATGGAACTTCATAGAATGCACC
rs3917316	ACGTTGGATGAGTATCTTGTATATGCCAC	ACGTTGGATGGTTAGGAGATGTAGAAGATG
rs3171845	ACGTTGGATGGAACCTATTAGGCTGAATATC	ACGTTGGATGACAGATGCTCTAAATACCTG
rs3171846	ACGTTGGATGTGCTCTATTATCATCAGAGAC	ACGTTGGATGCTGCCTCAACATTCATATTGG
rs3917317	ACGTTGGATGTCTCAGCCCTGAATTCATC	ACGTTGGATGGAGATGATCTTCATGCATCAG
rs3917318	ACGTTGGATGAAAGCCTTGTGTGGCTTTG	ACGTTGGATGGTCTGAAAAACGGAAGCAC
rs3917319	ACGTTGGATGGTGCTTCTCTGTTTTCAGAC	ACGTTGGATGAAGCCTGATGTTTCTCTGAC
rs3917320	ACGTTGGATGCGTAAAGAAAAGCAGAAGAC	ACGTTGGATGTGCTCTTCAGATGAACCCAC
rs3917321	ACGTTGGATGAGAGAACTGCAAAAGAGAG	ACGTTGGATGACAGAGGACCTCAAAAAGAAC
rs3917322	ACGTTGGATGAGTCAGCATGAGGCATAACC	ACGTTGGATGAGCATGGAGAAGTTGCCAAG
rs3917323	ACGTTGGATGACTTCAGAGTAGAGGCTTGT	ACGTTGGATGAAGTGTGGGATATAGGCGC
rs3917324	ACGTTGGATGATCACCAGAGGTCAGGAGTT	ACGTTGGATGCCACCATGCCTAGCTCATTT
rs3917325	ACGTTGGATGATGTTAAGTCATCCACAGCC	ACGTTGGATGTGTCAGTCTCACTTTGCCTG
rs3732134	ACGTTGGATGTTAATGCTTTCCTCCCTGGC	ACGTTGGATGAGGAGGCTGTCTCTCCCAAA
rs3732133	ACGTTGGATGAAGGATGGTTCATGTTGGG	ACGTTGGATGTTACGCTCTTTGGAGGAACAG
rs2110726	ACGTTGGATGAAGGATGGTTCATGTTGGG	ACGTTGGATGTACGCTCTTTGGAGGAACAGC
rs3917326	ACGTTGGATGTGCACAGGCCACACATGAAC	ACGTTGGATGTCTCAGCTCCTGAACAGGTGG
rs3917327	ACGTTGGATGAAAGCATGGGCTTCAGCTCC	ACGTTGGATGATGCCGCTCTTCTGTATACC
rs3917328	ACGTTGGATGTAGGCCAAAGGAGGAGGAAGG	ACGTTGGATGTGTGTGAATCCCAGGTTTG
rs3732131	ACGTTGGATGAGGGCCTTCTCGCATTTCTC	ACGTTGGATGTCCCGAGAGCTGTGGAATTC
rs3732130	ACGTTGGATGTCCCGAGAGCTGTGGAATTG	ACGTTGGATGAGGCCTTCTCGCATTTCTCT
rs3917329	ACGTTGGATGAAGTCAAAGGAAGTTACAGG	ACGTTGGATGGTGCAAAAGTTATCCCCATC
rs3917330	ACGTTGGATGTAAAGCAATAGCCTCTGACC	ACGTTGGATGAACAAGGTGAGGAGACCTTC
rs3917331	ACGTTGGATGAACAAGGTGAGGAGACCTTC	ACGTTGGATGTAAAGCCAATAGCCTCTGACC
rs3917344	ACGTTGGATGAGAGTTCCTCTGTTGTGGG	ACGTTGGATGTGAAGAAGGAGGTAGGCGC
rs3917332	ACGTTGGATGATTGGCTTAACAGTGAGCCC	ACGTTGGATGAGAAGCAATGAGCAGAGGG
rs3917333	ACGTTGGATGTAAAGGAGGAGGCACTGACT	ACGTTGGATGGCTGTCCAAAATGCATGCTC
rs3917334	ACGTTGGATGGACTCAGACTCTAAGCCAAC	ACGTTGGATGAGTCAAGTGCCCTCTCTTAC
rs1030021	ACGTTGGATGCATTGCTTCATGTTCTTACC	ACGTTGGATGAAAACCTGGGCATAACCTCTC
rs2241132	ACGTTGGATGAGGAGGATGGGCGAGGAGTA	ACGTTGGATGTCTGGACACCAAGCCTGCTTC
rs2241131	ACGTTGGATGAGGAGGATGGGCGAGGAGTA	ACGTTGGATGCTGTCAAGGTGGCAGAAGCAG
rs3835036	ACGTTGGATGTTCCGCGAAGAGGAAACAG	ACGTTGGATGTCACTCCAAAGCTCAAAAGGC
rs1997504	ACGTTGGATGCCTGTAAATCCCAGTACTTTG	ACGTTGGATGTGTTAGCCAGGATGGTCTAG
rs1805232	ACGTTGGATGTTGAGTAGCTGGGACTACAG	ACGTTGGATGTAAACAGGCTGAAACCCGCTC
rs1971696	ACGTTGGATGTAGACCATCCTGGCTAACAC	ACGTTGGATGTTGAGTAGCTGGGACTACAG
rs1971695	ACGTTGGATGTTGAGTAGCTGGGACTACAG	ACGTTGGATGTAGACCATCCTGGCTAACAC
rs3771199	ACGTTGGATGTGAAATAACACAGGCTGCTG	ACGTTGGATGTGCTTACCTGAAATGAGCAGC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1922303	ACGTTGGATGGTGGGGCCTGAATAAAACAC	ACGTTGGATGTAAGGTATGCAAGCCAGTG
rs3213734	ACGTTGGATGAACCCACTGTTTTTATAGG	ACGTTGGATGTGACTGCTAGCTAACTAATC
rs1997505	ACGTTGGATGAAAACTCATGACCCAGAGGG	ACGTTGGATGCCACAGGCTAGTCATTTGAG
rs1558649	ACGTTGGATGTGCATGGTGGTTCATGCTG	ACGTTGGATGAACCTTGCTATGATGCCAG
rs1558648	ACGTTGGATGAGATTTCTACAACCTTG	ACGTTGGATGAGGTACATTTTATACCCACC
rs1558647	ACGTTGGATGAAAAATGTGGTCAATCTCAC	ACGTTGGATGCAACCTTGTGTTGAACTTTG
rs1558646	ACGTTGGATGGGCCCTTGGTTAGAGTTTAGG	ACGTTGGATGGCTTTAGGTTGGCATAAAATGG
rs1882514	ACGTTGGATGTTCCCTTCTGTCATCCTG	ACGTTGGATGCAGAGGTGAGGTGAGCGAAG
rs1882513	ACGTTGGATGAAAGTAGAGAGGTGAGGTGG	ACGTTGGATGGGGCATTACACTTTTCCACC
rs867770	ACGTTGGATGGCAGGTGGTGATTTTCAGAG	ACGTTGGATGACACTGCAGAAGTAGCTTGC
rs2310235	ACGTTGGATGGAGCTGGAATAGGGAAATCAG	ACGTTGGATGGCCATTATCCAGAACCCTCTG
rs870684	ACGTTGGATGCCCAAATTACTCCTCAGCAC	ACGTTGGATGAGAGCGCGAAGTAACCTCAG
rs3771197	ACGTTGGATGTAAGCAGTCCAGTCCACAG	ACGTTGGATGCCCTTTGCTTACCTAAGACTG
rs3771196	ACGTTGGATGCCTTTAACTACACAGCAAC	ACGTTGGATGAGAAGCTTTCTGAGCAAGAG
rs3821207	ACGTTGGATGAAAACCATGAAGAGGAGACG	ACGTTGGATGGCAACTAAAGGATCTTTCTC
rs3771195	ACGTTGGATGTTGGAGCGCTATTGTTCTTAAC	ACGTTGGATGTAAGCTCTCAATGAGCTTGG
rs3771194	ACGTTGGATGATCTTAAAGTTTCAGCCTTGC	ACGTTGGATGATAATGTTCCAGTGGATCAG
rs3771193	ACGTTGGATGATGTTCCAGTGGATCAGAATAG	ACGTTGGATGTTAAAGTTCAGCCTTGACAG
rs3771192	ACGTTGGATGGGGTTTCACTCTTTTCAAG	ACGTTGGATGATAGCAAAAGCGACAGAATGG
rs3755290	ACGTTGGATGCCAATTACACTTTCTGCAC	ACGTTGGATGTGACATCTGTTACAGCCTTC
rs3821206	ACGTTGGATGAGAGTGAGGGCTACATGAGTTG	ACGTTGGATGCCCTCTGCAAAAACCTGACC
rs2302623	ACGTTGGATGGAATACCTAGAAAACCTGTGTG	ACGTTGGATGATCTGTTGCTTCCAGCTAG
rs3755289	ACGTTGGATGTCTCAGAACCTCTGAGCTCTGC	ACGTTGGATGCCCTCAGCCTTCAATGTCTGTG
rs1922302	ACGTTGGATGGAGATCTTCACTCTTTTGG	ACGTTGGATGGCCACACATAAAACCATATC
rs2110725	ACGTTGGATGATTCTCTCCCAAGCTATAC	ACGTTGGATGCAATAACCCAGGTTTGTGACC
rs1465326	ACGTTGGATGTGTGTTTGAAAAACCAATG	ACGTTGGATGTTTACAGAGTTCCAGGAGGG
rs2871458	ACGTTGGATGAGATCCCCATAGGGATCCAC	ACGTTGGATGCACACTTCAGAGTACTAGGG
rs2080310	ACGTTGGATGGAATGATCCATTCCAGGGTG	ACGTTGGATGGACATCATGTACTGTGCC
rs1922289	ACGTTGGATGTGAGTTTGGTCAATGCTACG	ACGTTGGATGATACAGCGGATGACCTACTC
rs1922290	ACGTTGGATGACACCCAGTTTCCAGCTTTG	ACGTTGGATGCTTCGGCTCTCTGTTGTTTT
rs1922291	ACGTTGGATGGACTTCTCTGCTACCAACAAC	ACGTTGGATGCTCATGGGGAGAGGAATCAA
rs1922292	ACGTTGGATGATATTACCTCACAATGCAAG	ACGTTGGATGGCTATTGATCCTTTTCC
rs3815517	ACGTTGGATGACAAATGGTTGTCTGGAAGG	ACGTTGGATGAATAGCCCCCTAGGCAATG
rs2241130	ACGTTGGATGGAGAAATGGATCTTACGTCTC	ACGTTGGATGCAATCCACCTATCACATAG
rs1922295	ACGTTGGATGGTTATATCATGAGCCATCGG	ACGTTGGATGGTGTCATTGTCAGTTTGTTC
rs1922294	ACGTTGGATGCGGGCATCAAAAGCAAAACAC	ACGTTGGATGACCTGCTTCCCTAAGAGTCC
rs2302624	ACGTTGGATGACTCTCAGTGGTTACACAC	ACGTTGGATGGCATTAGAGACTCATGCTCC
rs2310240	ACGTTGGATGAAATTCAAGTCTCTCTCTT	ACGTTGGATGGTGGTTTACCAAGACAGTTG
rs1024792	ACGTTGGATGGCTGTGTGGTTTACCAAGAC	ACGTTGGATGCCACACACGTCGCTGTCAA
rs3836112	ACGTTGGATGACGCACGTGTGTGGCTAGCTA	ACGTTGGATGGATGATGCAAGCATAGG
rs3074969	ACGTTGGATGACGTGTGTGGCTAGCTACAT	ACGTTGGATGGGCTTTAGCTTGATGTATGC
rs917994	ACGTTGGATGCCCTCCCTAGAAATGCAAGT	ACGTTGGATGAAGCAGAGAATGTGCACACC
rs2041753	ACGTTGGATGTCCACATGTTGCAACCCGAG	ACGTTGGATGTAACCTGTGAGGTGACACAGC
rs2041752	ACGTTGGATGGAACCTCTTAGAGGTACCAG	ACGTTGGATGTCTTCTCCATCACTTTCCC
rs1024791	ACGTTGGATGGTGTAAAGGAGCTGCAGATAC	ACGTTGGATGAACACAGCCAGGAGGTTGG
rs1024790	ACGTTGGATGAGAAATTCAGCTGATTCT	ACGTTGGATGAAACTGTCCTCACTCACTTTAA

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs995515	ACGTTGGATGTGGGATGGAATCGCTATTG	ACGTTGGATGTGTCCCAACCTAGAAGTTTG
rs995514	ACGTTGGATGGCTTGGACTTGGCCCTCAGAA	ACGTTGGATGGCAATAGCGATTTCATATCCC
rs1922293	ACGTTGGATGGGACAGACTAAGGTTATAG	ACGTTGGATGGATTCAAATCTGGAGGTTGTC
rs3755287	ACGTTGGATGAAATTTGGGTGTGCTCTCCG	ACGTTGGATGGAGACTTACCAGCCTCTCAAC
rs3729564	ACGTTGGATGCCTGAGTCCCTCTGAATGTA	ACGTTGGATGTGCCCTCGAGAGTACTGATG
rs3771188	ACGTTGGATGAATCCAATCTGGGCACTTG	ACGTTGGATGAGATGAGGATGAGGAAGC
rs3771187	ACGTTGGATGAGAGTAGAGGATGAGGAAGC	ACGTTGGATGAATCCAATCTCGGGCACTTG
rs3771186	ACGTTGGATGAAGTGCCACAGGATTGGATTG	ACGTTGGATGGAGTAAGTCCCAATGCAGCC
rs3771185	ACGTTGGATGATCTTGAGGCCAAGATTTC	ACGTTGGATGGACCAAAATGTGTTCTTAG
rs2310241	ACGTTGGATGACCTTCTCCAGCTGGTTCTG	ACGTTGGATGTGGGAGTCCAGCTGTCTCAAC
rs2302621	ACGTTGGATGCGTCTACCCACGGAACTAG	ACGTTGGATGGGAAACAGTCAGCTCCTGG
rs2302620	ACGTTGGATGGTCTCTGTAGAATGGAAGGC	ACGTTGGATGTGGCTGTGTCTGTTGTGATC
rs3771184	ACGTTGGATGTCTCTAGGCCCTGTACTT	ACGTTGGATGACTTGGTTTGTCTCTCTCC
rs3834161	ACGTTGGATGAGGGAACCTGGTTGTCTGAG	ACGTTGGATGCAAAAGCAAGCACTTGTATGCC
rs3755286	ACGTTGGATGGCATCAAGTGCTTGCCTTGC	ACGTTGGATGGCAAGTTAGTGAATAGCCACG
rs3755285	ACGTTGGATGTGCAGATGCCAGAGCCAAAA	ACGTTGGATGACCTGAAGTGCTGCTAGTAC
rs1997502	ACGTTGGATGCGTATTTCTCTGGAAGCTC	ACGTTGGATGTCACTGACAGAGTCAGTGAG
rs3771182	ACGTTGGATGGCCACACAGAGATATTAC	ACGTTGGATGGATGTGTGTCATTTTGTGATG
rs3836111	ACGTTGGATGTCTACCCGCACTTGTTTTCC	ACGTTGGATGGGCTAAACGAAGCAAGCC
rs3771181	ACGTTGGATGTCTCTTCCAAAAAGTTCAG	ACGTTGGATGGCCAGAGAACTTTTTCCTG
rs955754	ACGTTGGATGGTGATGTGGCCAGAAATGAG	ACGTTGGATGTATCTCTCTGCTTCAGCTTG
rs2302612	ACGTTGGATGTGACAAACCTCGTGTCTCTCC	ACGTTGGATGAAGGTGTCTCGGCCGTTTCTCT
rs3755284	ACGTTGGATGGCTGCTCAGAATTTCTGGTTG	ACGTTGGATGGAGACTTCCATGTTTGAAGAG
rs3821205	ACGTTGGATGATGCCATCCTAAGACCACAG	ACGTTGGATGCTTAGTAAGCAGTCAGTGGG
rs3815511	ACGTTGGATGTACCACCCATCGCTGTGAA	ACGTTGGATGGTGGTCTTAGGATGGCATGG
rs2287041	ACGTTGGATGTGAAAGTCCATCCACACTG	ACGTTGGATGTGTGGTCTTAGGATGGCATG
rs2287040	ACGTTGGATGATAAAGAGTGGACCAATGTC	ACGTTGGATGTTATGTTCGAAGGTGACCTC
rs2270739	ACGTTGGATGTTACAGGCACACCCCTTACG	ACGTTGGATGAGCCACAGTGTGGGGAGAGT
rs3755283	ACGTTGGATGTCTTCTGCTGATTGCATCCC	ACGTTGGATGGAGAGTGAAGTGAAGAGAGT
rs3755282	ACGTTGGATGGAGGACCAAGCAAGATGAAG	ACGTTGGATGATATTTTGGCAGGCCAGCTC
rs1812326	ACGTTGGATGTTCAAGTGATTCTACTGCCG	ACGTTGGATGAACCCCGCTCTCTACTAAAC
rs1558626	ACGTTGGATGACCTCCAAGCATGATCTCAG	ACGTTGGATGTGGTGTTCCTCTGGATCTCG
rs1558625	ACGTTGGATGTGACGAAAGCAGGACCGACC	ACGTTGGATGTGAGATCATCGTTGGAGGTC
rs1558624	ACGTTGGATGGGAAAGAACGGCTGTCTTC	ACGTTGGATGATCCACAGGGTTCGTGTGTG
rs1558623	ACGTTGGATGAAGTCCCAACCCCAAGTGAG	ACGTTGGATGTTAGGAAGCGAAGGAAAAAC
rs1035131	ACGTTGGATGACTCTTCTTACCCTTGATGGC	ACGTTGGATGTAGGCTTCAGGATTTGGATGG
rs2110661	ACGTTGGATGCTCCTCCAAACCCACCTTT	ACGTTGGATGTGGATGGTGCACACCTCATG
rs1420093	ACGTTGGATGAAGAAATTTAAAGCCAGAG	ACGTTGGATGTATCTCAATAGAGGCTCTAC
rs3074971	ACGTTGGATGAAACAACTGAACCGCTAGG	ACGTTGGATGCAGCGTCTTCTGGGATATT
rs1345302	ACGTTGGATGGGTAAATCAGAAAAACAGATC	ACGTTGGATGTGCCAGTAGAAGTACAGATG
rs1420092	ACGTTGGATGGTGCTCAGAGATGGTTAAAC	ACGTTGGATGACTGCACCCTAGTTGATTTG
rs1345301	ACGTTGGATGGCTCAAGTCTGGAGAAATGA	ACGTTGGATGCATGGTTGGATTGTTGTTG
rs2310242	ACGTTGGATGCCACCACTCAACAGTTTGTCT	ACGTTGGATGGACAGCAAGAGTGAACCTCC
rs2310243	ACGTTGGATGTGTAGCTAAGCACTATAGCG	ACGTTGGATGGCTCCTCTAGATATGCATG
rs1882510	ACGTTGGATGCTCGTAGTCACTGGAGCTG	ACGTTGGATGAAGTCCAGGTTGGACCTGGT
rs1882511	ACGTTGGATGAAGGAACGTGACGGCCATG	ACGTTGGATGAATGGTGCAACTGCTTGGG

TABLE 12

dbSNP rs#	Extend Primer	Term Mix
rs3917304	GGTTACTAATGGTGGTTTTCTCTG	ACT
rs2041747	ATGCTAAGAGTTATTACATTTTG	ACT
rs3917305	GGAGATCCTTGCCCATAGAT	ACT
rs3771200	TACTGCTCATCTATGGGACAA	ACT
rs3917306	GCACCTTTGCATCTGCCCCA	ACT
rs3917307	AAGTTTGAATGCCATTTCTCT	ACT
rs3917308	TAGTCTTACCCATATGCATCATCA	ACT
rs3917310	ATGGAAGGATATACAATGTTTAT	CGT
rs3917311	ATTCATTTGGGGAAGAACTGATA	ACG
rs3917312	TACAAACACTGACTCTCACTTGTA	ACT
rs3917313	CTTGGTCCTTTACAGTTCCCT	ACT
rs3917314	GGATACTAATGTACAAGCAATGA	ACT
rs3917316	ATTTTAGAAACCCCTCTTAGTAAAA	CGT
rs3171845	TGAATATCATTTGTTTCTAA	ACT
rs3171846	ATCACAGAGCAAGGCCTA	CGT
rs3917317	AGTTTAAACAAAGGAGAGAGAGA	ACT
rs3917318	GTGTGGCTTTGGTTCAGGAG	ACT
rs3917319	GTTGAGGTCATTAATGAAAACGT	CGT
rs3917320	GAAGACTGATTATCATTTTAGTC	CGT
rs3917321	ACGTGCCTCTCGGGTAGC	ACT
rs3917322	CCATAAGACAGGAGGCACC	ACG
rs3917323	GGAAGATCTTTTAAAAAGGCA	ACT
rs3917324	TCAGGAGTTCGAGACCAGC	ACT
rs3917325	CCTGTAGAGTCACTGACCC	ACT
rs3732134	TTCTCCCTGGCATGACCAT	ACT
rs3732133	CAAGGGACATTGCAGACGGA	ACT
rs2110726	TGCAAGGACATTGCAGA	ACG
rs3917326	CCCACACATGAACCATCCTTCC	ACG
rs3917327	GCTTCAGCTCCTGAACAGGTG	ACT
rs3917328	GGAGGAAGGGTGCAGGCAA	ACT
rs3732131	TCTCGCATTTTCTCTAGCTGATC	ACT
rs3732130	GGATGTTCTGAATTTTGGTAAAAAT	ACG
rs3917329	CTTCTTCCTCCAGAATTCAAC	CGT
rs3917330	TCCCCAACACAGGAAGAACT	CGT
rs3917331	TGAGGAGACCTTCTGCAGAG	CGT
rs3917344	GAGTGGAGGTACAGAGCTAT	ACG
rs3917332	ACAGTGAGCCCTAACTCCC	CGT
rs3917333	GGGTGTCATCTCTGACCATC	CGT
rs3917334	TCAGACTCTAAGCCAACTGCCA	CGT

dbSNP rs#	Extend Primer	Term Mix
rs1030021	CTTTTAAATTTTGCCAGTTTTCG	ACT
rs2241132	CGGTGGGGACCGCTGG	ACT
rs2241131	CGGCGGGCGGTGGGGACC	ACT
rs3835036	GCGGAAGAGGAAACAGAGAACCA	ACT
rs1997504	GCGGGCGGATCACGAGG	ACG
rs1805232	CGCCCCACCGCGCCC	ACT
rs1971696	ACATTAAAAAATTAGCCGGGC	ACT
rs1971695	TACAGGCGCCGCCACC	ACT
rs3771199	TGACTGTGGTCAGCTGGAAA	ACT
rs1922303	GGGGCCTGAATAAACACATCTGT	ACT
rs3213734	TTTAAGGCAGAATTGGTAAAGAAA	ACT
rs1997503	AGAGGGGTGTGCTGGCAGGC	ACT
rs1558649	GGTGGTTCATGCCTGTAATCC	ACG
rs1558648	TGTTGAACCTTTGTATTATAAGCC	ACT
rs1558647	GGTACATTTTATACCCACCAAA	ACG
rs1558646	CTTGGTTAGAGTTTAGGGCACAT	ACT
rs1882514	GGATTACGTGTCCATCACTT	ACT
rs1882513	GTGGGCTAATTCCAGTTAAGA	ACG
rs867770	AGAAGTAGCTTGCCCTGAGAGC	ACG
rs2310235	GGGAATCAGTCAGAAAAGTAATA	CGT
rs870684	CACAGTGGTTTTGGGTCCC	ACG
rs3771197	GTTCCAGTCCACAGAATTAGT	ACT
rs3771196	CTACACAGCAACTAAAGGATC	CGT
rs3821207	AAGAGGAGACGAGCATCAGA	ACT
rs3771195	TTAATCTTGTTAGTGAGACATTA	ACG
rs3771194	TGTCGCTTTGCTATAACTTAGACT	ACT
rs3771193	GTTATAGCAAAAGCAGAGAATG	ACT
rs3771192	CATCTTAAAGTTACGCTTGCA	ACT
rs3755290	TGCACCTATCAAGCATTGGAC	ACT
rs3821206	GGAAGGAAGACTTCATGGAG	ACT
rs2302623	GAAACCTGTGTGATCCCTAG	CGT
rs3755289	TCAGCTGGAAGGCCCGCA	ACT
rs1922302	TTAATTCCTAGGTATTTAATTCG	ACT
rs2110725	CATTTTACAGAGTTCCAGGAGGG	ACT
rs1465326	GGCTCTGTTTCTGACAATAACGAG	ACT
rs2871458	GGATCCACACCCAGAA	ACT
rs2080310	GGTGGATCAGAAGTGCAGGT	ACT
rs1922289	CATTGCTACGTTGAGTATGAG	ACT
rs1922290	CCCAGTTTCCAGCTTTGGATATAC	ACT
rs1922291	TCTGCTACCACTTTTCCA	ACG
rs1922292	ACCTCACAATGCAAGATATATTA	CGT
rs3815517	GCCACTGGCCCTTGTTGG	CGT
rs2241130	GATCTTACTGCTCTCAGGGAT	ACT

dbSNP rs#	Extend Primer	Term Mix
rs1922295	GCCTTCAAAGCTTAATGCC	ACG
rs1922294	GTTCTTGTCTATACTAAACAAGC	ACT
rs2302622	CACACTGTTGACAGGTGTTCAAAAC	ACT
rs2310240	TGCAAAACACACACACACACACA	ACT
rs1024792	CGTGTCAAACACACACACACACA	ACT
rs3836112	TGGCTAGCTACATGCAAGAG	ACT
rs3074969	TGGCTAGCTACATGCAAGAG	ACT
rs917994	CAGTGAATAGGGATCTGTGC	ACT
rs2041753	CCCATGTGCTCAGGGTGAG	ACT
rs2041752	CTTAGAGTACCAGAGAGAGA	ACT
rs1024791	CTGGCTGATGTCAGAAAGCA	ACG
rs1024790	CACAGAGAGGTTGAGTGACA	ACT
rs995515	CTATTGGTCAGCTTCAGTCTAT	ACT
rs995514	ACTTGGCCTCAGAATCCTTC	ACT
rs1922293	GCCTTCCATTGACTTCCTTA	ACG
rs3755287	GGTGTGCTCTCCGTGAATTCGC	ACT
rs3729564	TTCCAATTTCACTCTTTTAACT	ACG
rs3771188	TGTGAGAACCCCTCACTTCA	ACT
rs3771187	TCTGTCTTATGATTGAAGTGAG	ACT
rs3771186	CGGTGTGTGGTGCAAGTGC	ACT
rs3771185	AGGCCCAAGATTTCTCATTTACT	ACT
rs2310241	CAGCTGGTTCTGCTGCC	ACT
rs2302621	GGGCTCTGCAGACTTTTACTC	ACT
rs2302620	CTGTAGAATGGAAGGCACTTCG	ACT
rs3771184	CCCTGTACTTGGTGCCTGAAG	ACT
rs3834161	GTTGTCTGAGAACGTTTTATGGG	ACT
rs3755286	AGTACGGTTGTTGCCACAT	ACT
rs3755285	ACCCCTCCCCATGCC	ACT
rs1997502	TCCTGGAAGCTCAGGCCCC	ACT
rs3771182	GTTCTCGTAGACAGAGCTGT	ACT
rs3836111	CCTTGTTTCCCTTTGATCACT	CGT
rs3771181	TCAGAAACATAAGAACTTATGAA	ACT
rs955754	GCCAGAAATGAGAATTAAAGGCAG	ACT
rs2302612	GTAGCAAGGTGTGTGCTGC	ACT
rs3755284	TGCTAAAAGAGAGAGAAAGG	CGT
rs3821205	CCTCTGGCTCCCTCTCTC	ACT
rs3815511	GGCACAGCACTCCTAACC	ACG
rs2287041	CATCCACACTGGGTACCA	CGT
rs2287040	TGGACCAATGTCAAGTCGAG	ACT
rs2287039	CAGAGAGGACACGTCCCC	ACT
rs3755283	CCTATTATTTCAATAGGAATTAGT	ACT
rs3755282	CATGTGAAAAGTGCTTGGCAAAC	ACG
rs1812326	AGGTGCATGCCACCACACT	ACG

dbSNP rs#	Extend Primer	Term Mix
rs1558626	TTCAGGCTAGTTTCACCCGA	CGT
rs1558625	GCAGGACCGACCCTCCCT	ACG
rs1558624	GGCCTGTCTTCAGGGCTC	ACT
rs1558623	AAGTGAGGGCTCCAGCGAT	CGT
rs1035131	GATGGCACATCTCTAGAAAAG	CGT
rs2110661	GTCTCTCCTCAGATATGAGCC	ACG
rs1420093	TTTAAAGCCCAGAGATTTTAAAAA	ACT
rs3074971	CTAGGAAAAAGAAAGGCAACA	CGT
rs1345302	GAAAACAGAGTCTTTACCAATC	ACT
rs1420092	AGAGATGGTTAAACAGGCACA	ACT
rs1345301	CACAAGTTTACACCTTTTCTTTA	ACT
rs2310242	CTCTATAACCTTACAAATGTTATT	CGT
rs2310243	TGCAGTTTGGGACACAAAGG	ACG
rs1882510	AAAAGTGAAGCTGGGCTGTC	ACT
rs1882511	GGGAGGCATTACGGGATCA	ACG

Genetic Analysis

[0236] Allelotyping results from the discovery cohort are shown for cases and controls in Table 13. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 (A1 AF = 1-A2 AF). For example, the SNP rs3917304 has the following case and control allele frequencies: case A1 (G) = 0.431; case A2 (T) = 0.569; control A1 (G) = 0.450; and control A2 (T) = 0.550, where the nucleotide is provided in parenthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 13

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3917304	225	102409525	G/T	0.569	0.550	0.460
rs2041747	509	102409809	C/T	0.027	0.023	0.800
rs3917305	860	102410160	C/T			
rs3771200	874	102410174	C/T	0.467	0.473	0.809
rs3917306	939	102410239	A/G			
rs3917307	1483	102410783	G/T			
rs3917308	1798	102411098	C/T			
rs3917310	2189	102411489	A/T			
rs3917311	2215	102411515	A/G	0.945	0.964	0.193
rs3917312	2282	102411582	C/G			
rs3917313	2340	102411640	C/T			
rs3917314	2963	102412263	A/C	0.025	0.028	0.881
rs3917316	3369	102412669	-/T	0.785	0.856	0.004
rs3171845	3481	102412781	A/G	0.904	0.894	0.624

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	FA2 Case AF	FA2 Control AF	F p- Value
rs3171846	3564	102412864	G/T			
rs3917317	3653	102412953	-T/C	0.320	0.325	0.824
rs3917318	4860	102414160	A/G	0.151	0.151	0.978
rs3917319	4941	102414241	A/T			
rs3917320	4975	102414275	A/C	0.936	0.946	0.585
rs3917321	5321	102414621	A/G			
rs3917322	5346	102414646	A/G	0.978	untyped	NA
rs3917323	5541	102414841	A/G	0.977	untyped	NA
rs3917324	5633	102414933	C/G			
rs3917325	6007	102415307	G/T	0.029	0.030	0.901
rs3732134	6317	102415617	C/G			
rs3732133	6378	102415678	A/G			
rs2110726	6382	102415682	C/T	0.320	0.318	0.944
rs3917326	6426	102415726	C/T			
rs3917327	6479	102415779	C/G			
rs3917328	6641	102415941	C/T	0.898	0.891	0.706
rs3732131	6703	102416003	C/T	0.047	0.036	0.434
rs3732130	6705	102416005	C/T			
rs3917329	7963	102417263	G/T	0.070	0.081	0.473
rs3917330	8525	102417825	G/T			
rs3917331	8526	102417826	A/T			
rs3917344	8598	102417898	C/T			
rs3917332	8624	102417924	A/T	0.224	0.209	0.473
rs3917333	8883	102418183	A/T			
rs3917334	8980	102418280	G/T			
rs1030021	13578	102422878	G/T	0.160	0.183	0.255
rs2241132	16135	102425435	G/T	0.604	0.631	0.385
rs2241131	16141	102425441	C/T	0.451	0.477	0.282
rs3835036	16642	102425942	-T/GG	0.424	0.463	0.112
rs1997504	16931	102426231	A/G			
rs1805232	17004	102426304	A/G			
rs1971696	17009	102426309	C/T			
rs1971695	17010	102426310	A/G			
rs3771199	18713	102428013	C/T	0.299	0.291	0.726
rs1922303	18853	102428153	C/T			
rs3213734	20783	102430083	C/T	0.826	0.860	0.099
rs1997503	21335	102430635	A/G	0.830	0.806	0.281
rs1558649	22180	102431480	C/T			
rs1558648	22268	102431568	A/C	0.127	0.142	0.439
rs1558647	22285	102431585	C/T	0.824	0.825	0.955
rs1558646	25378	102434678	C/T	0.576	0.580	0.886
rs1882514	25906	102435206	C/G	0.547	0.556	0.730
rs1882513	26015	102435315	A/G	0.500	0.513	0.574
rs867770	26475	102435775	A/G			
rs2310235	26798	102436098	A/T	0.608	0.573	0.252
rs870684	27042	102436342	A/G	0.687	0.685	0.931
rs3771197	27649	102436949	A/G	0.534	0.544	0.676
rs3771196	27827	102437127	A/T	0.171	0.189	0.558
rs3821207	27873	102437173	A/G	0.029	0.033	0.751
rs3771195	28122	102437422	A/G	0.342	0.326	0.480
rs3771194	28202	102437502	A/G	0.474	0.465	0.725
rs3771193	28232	102437532	A/C			
rs3771192	28240	102437540	G/T			
rs3755290	29546	102438846	G/T	0.348	0.329	0.428
rs3821206	29748	102439048	A/G	0.914	0.920	0.803
rs2302623	30054	102439354	A/T	0.261	0.263	0.948

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3755289	30646	102439946	G/T	0.429	0.442	0.621
rs1922302	31149	102440449	A/C	0.574	0.539	0.166
rs2110725	36912	102446212	A/C			
rs1465326	36936	102446236	C/G	0.592	0.613	0.413
rs2871458	37184	102446484	C/T	0.068	0.059	0.549
rs2080310	39064	102448364	C/T	0.258	0.256	0.926
rs1922289	39343	102448643	G/T	0.593	0.593	0.976
rs1922290	40868	102450168	C/G	0.577	0.595	0.489
rs1922291	40917	102450217	A/G	0.344	0.358	0.549
rs1922292	41113	102450413	A/C	0.226	0.221	0.874
rs3815517	47343	102456643	A/T	0.291	0.291	0.984
rs2241130	47806	102457106	A/G	0.112	0.088	0.153
rs1922295	47911	102457211	A/G	0.362	0.349	0.594
rs1922294	48009	102457309	C/T	0.075	0.065	0.581
rs2302622	48621	102457921	C/G			
rs2310240	49245	102458545	C/G			
rs1024792	49247	102458547	C/G			
rs3836112	49299	102458599	-CTCT	0.374	0.360	0.568
rs3074969	49302	102458602	-AGAG	0.361	0.353	0.747
rs917994	49514	102458814	C/T	0.289	0.304	0.544
rs2041753	49626	102458926	G/T	0.330	0.329	0.981
rs2041752	49791	102459091	A/G	0.492	0.528	0.176
rs1024791	50010	102459310	A/G			
rs1024790	50294	102459594	A/G	0.771	0.776	0.828
rs9955515	51482	102460782	A/G/T	0.312	0.310	0.917
rs9955514	51556	102460856	A/G	0.393	0.420	0.246
rs1922293	51855	102461155	A/G	0.597	0.608	0.653
rs3755287	51956	102461256	C/T	0.869	0.885	0.458
rs3729564	52155	102461455	A/G	0.331	0.315	0.511
rs3771188	52448	102461748	A/G			
rs3771187	52458	102461758	C/T	0.280	0.258	0.332
rs3771186	52511	102461811	C/T	0.764	0.813	0.048
rs3771185	52607	102461907	A/G	0.429	0.395	0.160
rs2310241	54049	102463349	A/C	0.424	0.406	0.462
rs2302621	54224	102463524	A/C	0.323	0.340	0.473
rs2302620	54567	102463867	A/G	0.103	0.092	0.512
rs3771184	55052	102464352	C/T	0.779	0.809	0.173
rs3834161	55857	102465157	-C	0.062	0.069	0.674
rs3755286	55941	102465241	C/G	0.786	0.817	0.150
rs3755285	56120	102465420	A/G	0.184	0.174	0.619
rs1997502	56349	102465649	C/T	0.580	0.564	0.559
rs3771182	56727	102466027	A/G	0.101	0.085	0.352
rs3836111	57232	102466532	-CT	0.138	0.113	0.154
rs3771181	58806	102468106	C/T			
rs955754	61181	102470481	C/T	0.194	0.172	0.291
rs2302612	63808	102473108	A/G	0.135	0.120	0.456
rs3755284	64526	102473826	A/T	0.757	0.789	0.141
rs3821205	64865	102474165	A/G	0.831	0.832	0.992
rs3815511	64928	102474228	C/T	0.022	untyped	NA
rs2287041	64966	102474266	A/C	0.118	0.100	0.346
rs2287040	65080	102474380	A/G	0.518	0.536	0.462
rs2287039	65690	102474990	C/T	0.975	0.970	0.752
rs3755283	66228	102475528	A/G			
rs3755282	66982	102476282	A/G	0.312	0.295	0.452
rs1812326	72511	102481811	A/G	0.343	0.297	0.054
rs1558626	74170	102483470	A/T	0.536	0.551	0.643

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1558625	74264	102483564	C/T	0.661	0.697	0.128
rs1558624	74333	102483633	C/T	0.322	0.278	0.074
rs1558623	74502	102483802	A/T	0.303	0.273	0.200
rs1035131	74741	102484041	A/C	0.543	0.595	0.046
rs2110661	75321	102484621	C/T	0.430	0.413	0.485
rs1420093	82558	102491858	A/G	0.381	0.388	0.826
rs3074971	85366	102494666	-TTG	0.438	0.479	0.096
rs1345302	85469	102494769	C/T	0.428	0.397	0.223
rs1420092	86485	102495785	G/T	0.792	0.793	0.965
rs1345301	87687	102496987	C/T	0.514	0.477	0.131
rs2310242	89463	102498763	G/T	0.108	0.114	0.804
rs2310243	89660	102498960	A/G	0.490	0.523	0.194
rs1882510	95718	102505018	C/T	0.617	0.667	0.075
rs1882511	95821	102505121	A/G	0.664	0.652	0.599

[0237] The IL1RL2 proximal SNPs were also allelotyped in the replication cohorts using the methods described herein and the primers provided in Tables 11 and 12. The replication allelotyping results for replication cohort #1 and replication cohort #2 are provided in Tables 14 and 15, respectively.

TABLE 14

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3917304	225	102409525	G/T	0.599	0.592	0.843
rs2041747	509	102409809	C/T	0.021	0.026	0.845
rs3917305	860	102410160	C/T			
rs3771200	874	102410174	C/T	0.442	0.482	0.207
rs3917306	939	102410239	A/G			
rs3917307	1483	102410783	G/T			
rs3917308	1798	102411098	C/T			
rs3917310	2189	102411489	A/T			
rs3917311	2215	102411515	A/G	0.933	0.974	0.042
rs3917312	2282	102411582	C/G			
rs3917313	2340	102411640	C/T			
rs3917314	2963	102412263	A/C	0.036	0.038	0.918
rs3917316	3369	102412669	-T	0.904	0.963	0.072
rs3171845	3481	102412781	A/G	0.898	0.882	0.610
rs3171846	3564	102412864	G/T			
rs3917317	3653	102412953	-T/C	0.313	0.323	0.759
rs3917318	4860	102414160	A/G	0.149	0.142	0.803
rs3917319	4941	102414241	A/T			
rs3917320	4975	102414275	A/C	0.921	0.930	0.749
rs3917321	5321	102414621	A/G			
rs3917322	5346	102414646	A/G			
rs3917323	5541	102414841	A/G			
rs3917324	5633	102414933	C/G			
rs3917325	6007	102415307	G/T	0.033	0.040	0.716
rs3732134	6317	102415617	C/G			
rs3732133	6378	102415678	A/G			
rs2110726	6382	102415682	C/T	0.334	0.339	0.880
rs3917326	6426	102415726	C/T			
rs3917327	6479	102415779	C/G			

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3917328	6641	102415941	C/T	0.885	0.867	0.523
rs3732131	6703	102416003	C/T	0.045	0.022	0.224
rs3732130	6705	102416005	C/T			
rs3917329	7963	102417263	G/T	0.068	0.091	0.296
rs3917330	8525	102417825	G/T			
rs3917331	8526	102417826	A/T			
rs3917344	8598	102417898	C/T			
rs3917332	8624	102417924	A/T	0.203	0.195	0.785
rs3917333	8883	102418183	A/T			
rs3917334	8980	102418280	G/T			
rs1030021	13578	102422878	G/T	0.148	0.174	0.325
rs2241132	16135	102425435	G/T	0.604	0.595	0.815
rs2241131	16141	102425441	G/T	0.452	0.464	0.696
rs3835036	16642	102425942	-T/GG	0.402	0.479	0.017
rs1997504	16931	102426231	A/G			
rs1805232	17004	102426304	A/G			
rs1971696	17009	102426309	C/T			
rs1971695	17010	102426310	A/G			
rs3771199	18713	102428013	C/T	0.317	0.310	0.818
rs1922303	18853	102428153	C/T			
rs3213734	20783	102430083	C/T	0.824	0.892	0.012
rs1997503	21335	102430635	A/G	0.838	0.790	0.114
rs1558649	22180	102431480	C/T			
rs1558648	22268	102431568	A/C	0.125	0.164	0.121
rs1558647	22285	102431585	C/T	0.834	0.831	0.895
rs1558646	25378	102434678	C/T	0.547	0.561	0.672
rs1882514	25906	102435206	C/G	0.538	0.542	0.905
rs1882513	26015	102435315	A/G	0.471	0.497	0.414
rs867770	26475	102435775	A/G			
rs2310235	26798	102436098	A/T	0.562	NA	0.608
rs870684	27042	102436342	A/G	0.657	0.680	0.509
rs3771197	27649	102436949	A/G	0.502	0.534	0.351
rs3771196	27827	102437127	A/T	0.171	0.189	0.558
rs3821207	27873	102437173	A/G	0.033	0.038	0.821
rs3771195	28122	102437422	A/G	0.374	0.342	0.311
rs3771194	28202	102437502	A/G	0.493	0.480	0.696
rs3771193	28232	102437532	A/C			
rs3771192	28240	102437540	G/T			
rs3755290	29546	102438846	G/T	0.364	0.346	0.602
rs3821206	29748	102439048	A/G	0.940	NA	0.914
rs2302623	30054	102439354	A/T	0.267	0.268	0.984
rs3755289	30646	102439946	G/T	0.417	0.451	0.281
rs1922302	31149	102440449	A/C	0.600	0.559	0.245
rs2110725	36912	102446212	A/C			
rs1465326	36936	102446236	C/G	0.573	0.614	0.296
rs2871458	37184	102446484	C/T	0.085	0.070	0.530
rs2080310	39064	102448364	C/T	0.277	0.268	0.776
rs1922289	39343	102448643	G/T	0.580	0.576	0.924
rs1922290	40868	102450168	C/G	0.558	0.579	0.556
rs1922291	40917	102450217	A/G	0.322	0.348	0.401
rs1922292	41113	102450413	A/C	0.235	untyped	NA
rs3815517	47343	102456643	A/T	0.310	0.312	0.950
rs2241130	47806	102457106	A/G	0.110	0.068	0.071
rs1922295	47911	102457211	A/G	0.378	0.364	0.695
rs1922294	48009	102457309	C/T	0.061	0.055	0.799
rs2302622	48621	102457921	C/G			

dbSNP rs#	Position in SEQ ID NO: 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs2310240	49245	102458545	C/G			
rs1024792	49247	102458547	C/G			
rs3836112	49299	102458599	-CTCT	0.407	0.378	0.382
rs3074969	49302	102458602	-GAG	0.385	0.362	0.497
rs917994	49514	102458814	C/T	0.271	0.281	0.757
rs2041753	49626	102458926	G/T	0.357	0.342	0.672
rs2041752	49791	102459091	A/G	0.459	0.511	0.155
rs1024791	50010	102459310	A/G			
rs1024790	50294	102459594	A/G	0.781	0.773	0.769
rs995514	51482	102460782	A/G/T	0.331	0.323	0.825
rs995514	51556	102460856	A/G	0.373	0.412	0.221
rs1922293	51855	102461155	A/G	0.568	0.597	0.376
rs3755287	51956	102461256	C/T	0.867	0.907	0.138
rs3729564	52155	102461455	A/G	0.362	0.320	0.212
rs3771188	52448	102461748	A/G			
rs3771187	52458	102461758	C/T	0.308	0.276	0.288
rs3771186	52511	102461811	C/T	0.761	0.847	0.003
rs3771185	52607	102461907	A/G	0.445	0.385	0.069
rs2310241	54049	102463349	A/C	0.446	0.400	0.161
rs2302621	54224	102463524	A/C	0.304	0.326	0.499
rs2302620	54567	102463867	A/G	0.100	0.074	0.236
rs3771184	55052	102464352	C/T	0.785	0.853	0.014
rs3834161	55857	102465157	-C	0.068	0.081	0.596
rs3755286	55941	102465241	C/G	0.791	0.850	0.038
rs3755285	56120	102465420	A/G	0.194	0.173	0.446
rs1997502	56349	102465649	C/T	0.604	0.577	0.536
rs3771182	56727	102466027	A/G	0.107	0.070	0.117
rs3836111	57232	102466532	-CT	0.137	0.090	0.048
rs3771181	58806	102468106	C/T			
rs955754	61181	102470481	C/T	0.209	0.160	0.084
rs2302612	63808	102473108	A/G	0.138	0.111	0.331
rs3755284	64526	102473826	A/T	0.754	0.829	0.010
rs3821205	64865	102474165	A/G	0.799	0.814	0.594
rs3815511	64928	102474228	C/T			
rs2287041	64966	102474266	A/C	0.113	0.074	0.143
rs2287040	65080	102474380	A/G	0.493	0.521	0.386
rs2287039	65690	102474990	C/T	0.970	0.962	0.703
rs3755283	66228	102475528	A/G			
rs3755282	66982	102476282	A/G	0.327	0.312	0.636
rs1812326	72511	102481811	A/G	0.362	0.299	0.067
rs1558626	74170	102483470	A/T	0.558	untyped	
rs1558625	74264	102483564	C/T	0.635	0.683	0.137
rs1558624	74333	102483633	C/T	0.350	0.278	0.024
rs1558623	74502	102483802	A/T	0.323	0.281	0.204
rs1035131	74741	102484041	A/C	0.513	0.598	0.026
rs2110661	75321	102484621	C/T	0.449	0.412	0.237
rs1420093	82558	102491858	A/G	0.390	untyped	
rs3074971	85366	102494666	-TTG	0.398	0.485	0.006
rs1345302	85469	102494769	C/T	0.468	0.392	0.036
rs1420092	86485	102495785	G/T	0.810	0.808	0.958
rs1345301	87687	102496987	C/T	0.554	0.470	0.016
rs2310242	89463	102498763	G/T	0.110	untyped	
rs2310243	89660	102498960	A/G	0.452	0.529	0.031
rs1882510	95718	102505018	C/T	0.597	0.688	0.022
rs1882511	95821	102505121	A/G	0.684	0.657	0.373

TABLE 15

dbSNP rs#	Position in Figure 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3917304	225	102409525	G/T	0.531	0.483	0.236
rs2041747	509	102409809	C/T	0.034	untyped	
rs3917305	860	102410160	C/T			
rs3771200	874	102410174	C/T	0.500	0.460	0.282
rs3917306	939	102410239	A/G			
rs3917307	1483	102410783	G/T			
rs3917308	1798	102411098	C/T			
rs3917310	2189	102411489	A/T			
rs3917311	2215	102411515	A/G	0.959	0.947	0.574
rs3917312	2282	102411582	C/G			
rs3917313	2340	102411640	C/T			
rs3917314	2963	102412263	A/C			
rs3917316	3369	102412669	-T	0.633	0.687	0.176
rs3171845	3481	102412781	A/G	0.912	0.913	0.964
rs3171846	3564	102412864	G/T			
rs3917317	3653	102412953	-T/C	0.329	0.329	0.999
rs3917318	4860	102414160	A/G	0.153	0.165	0.696
rs3917319	4941	102414241	A/T			
rs3917320	4975	102414275	A/C	0.955	0.971	0.463
rs3917321	5321	102414621	A/G			
rs3917322	5346	102414646	A/G			
rs3917323	5541	102414841	A/G			
rs3917324	5633	102414933	C/G			
rs3917325	6007	102415307	G/T	0.023	untyped	
rs3732134	6317	102415617	C/G			
rs3732133	6378	102415678	A/G			
rs2110726	6382	102415682	C/T	0.301	0.285	0.632
rs3917326	6426	102415726	C/T			
rs3917327	6479	102415779	C/G			
rs3917328	6641	102415941	C/T	0.915	0.929	0.621
rs3732131	6703	102416003	C/T	0.049	0.058	0.670
rs3732130	6705	102416005	C/T			
rs3917329	7963	102417263	G/T	0.073	0.067	0.798
rs3917330	8525	102417825	G/T			
rs3917331	8526	102417826	A/T			
rs3917344	8598	102417898	C/T			
rs3917332	8624	102417924	A/T	0.251	0.231	0.534
rs3917333	8883	102418183	A/T			
rs3917334	8980	102418280	G/T			
rs1030021	13578	102422878	G/T	0.176	0.197	0.489
rs2241132	16135	102425435	G/T	untyped	0.688	NA
rs2241131	16141	102425441	G/T	0.451	0.498	0.204
rs3835036	16642	102425942	-T/GG	0.453	0.439	0.715
rs1997504	16931	102426231	A/G			
rs1805232	17004	102426304	A/G			
rs1971696	17009	102426309	C/T			
rs1971695	17010	102426310	A/G			
rs3771199	18713	102428013	C/T	0.277	0.262	0.665
rs1922303	18853	102428153	C/T			
rs3213734	20783	102430083	C/T	0.827	0.809	0.573
rs1997503	21335	102430635	A/G	0.821	0.832	0.740
rs1558649	22180	102431480	C/T			
rs1558648	22268	102431568	A/C	0.130	0.105	0.368
rs1558647	22285	102431585	C/T	0.810	0.815	0.861

dbSNP rs#	Position in Figure 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1558646	25378	102434678	C/T	0.613	0.608	0.893
rs1882514	25906	102435206	C/G	0.558	0.578	0.630
rs1882513	26015	102435315	A/G	0.537	0.539	0.952
rs867770	26475	102435775	A/G			
rs2310235	26798	102436098	A/T	0.589	0.019	
rs870684	27042	102436342	A/G	0.726	0.693	0.392
rs3771197	27649	102436949	A/G	0.574	0.561	0.725
rs3771196	27827	102437127	A/T			
rs3821207	27873	102437173	A/G	0.023	0.026	0.884
rs3771195	28122	102437422	A/G	0.303	0.301	0.952
rs3771194	28202	102437502	A/G	0.450	0.442	0.832
rs3771193	28232	102437532	A/C			
rs3771192	28240	102437540	G/T			
rs3755290	29546	102438846	G/T	0.328	0.302	0.452
rs3821206	29748	102439048	A/G	0.889	0.026	
rs2302623	30054	102439354	A/T	0.254	0.255	0.962
rs3755289	30646	102439946	G/T	0.444	0.429	0.744
rs1922302	31149	102440449	A/C	0.541	0.507	0.364
rs2110725	36912	102446212	A/C			
rs1465326	36936	102446236	C/G	0.616	0.612	0.919
rs2871458	37184	102446484	C/T	0.046	0.041	0.775
rs2080310	39064	102448364	C/T	0.235	0.238	0.933
rs1922289	39343	102448643	G/T	0.611	0.618	0.845
rs1922290	40868	102450168	C/G	0.601	0.619	0.631
rs1922291	40917	102450217	A/G	0.372	0.374	0.961
rs1922292	41113	102450413	A/C	0.215	0.221	0.827
rs3815517	47343	102456643	A/T	0.268	0.257	0.766
rs2241130	47806	102457106	A/G	0.115	0.119	0.854
rs1922295	47911	102457211	A/G	0.342	0.325	0.632
rs1922294	48009	102457309	C/T	0.092	0.081	0.677
rs2302622	48621	102457921	C/G			
rs2310240	49245	102458545	C/G			
rs1024792	49247	102458547	C/G			
rs3836112	49299	102458599	-CTCT	0.332	0.332	0.999
rs3074969	49302	102458602	-AGAG	0.330	0.339	0.822
rs917994	49514	102458814	C/T	0.312	0.339	0.456
rs2041753	49626	102458926	G/T	0.296	0.310	0.737
rs2041752	49791	102459091	A/G	0.534	0.556	0.587
rs1024791	50010	102459310	A/G			
rs1024790	50294	102459594	A/G	0.759	0.780	0.498
rs995515	51482	102460782	A/G/T	0.288	0.288	0.992
rs995514	51566	102460856	A/G	0.417	0.434	0.657
rs1922293	51855	102461155	A/G	0.634	0.625	0.806
rs3755287	51956	102461256	C/T	0.873	0.850	0.471
rs3729564	52155	102461455	A/G	0.291	0.308	0.643
rs3771188	52448	102461748	A/G			
rs3771187	52458	102461758	C/T	0.246	0.231	0.677
rs3771186	52511	102461811	C/T	0.766	0.759	0.850
rs3771185	52607	102461907	A/G	0.409	0.410	0.972
rs2310241	54049	102463349	A/C	0.396	0.416	0.591
rs2302621	54224	102463524	A/C	0.347	0.363	0.667
rs2302620	54567	102463867	A/G	0.107	0.121	0.605
rs3771184	55052	102464352	C/T	0.772	0.740	0.364
rs3834161	55857	102465157	-C	0.054	0.051	0.860
rs3755286	55941	102465241	C/G	0.781	0.766	0.641
rs3755285	56120	102465420	A/G	0.172	0.175	0.897
rs1997502	56349	102465649	C/T	0.550	0.543	0.849

dbSNP rs#	Position in Figure 2	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs3771182	56727	102466027	A/G	0.094	0.109	0.562
rs3836111	57232	102466532	-/CT	0.139	0.148	0.750
rs3771181	58806	102468106	C/T			
rs955754	61181	102470481	C/T	0.173	0.190	0.571
rs2302612	63808	102473108	A/G	0.132	0.135	0.909
rs3755284	64526	102473826	A/T	0.760	0.726	0.332
rs3821205	64865	102474165	A/G	0.873	0.859	0.629
rs3615511	64928	102474228	C/T			
rs2287041	64966	102474266	A/C	0.124	0.141	0.517
rs2287040	65080	102474380	A/G	0.550	0.559	0.802
rs2287039	65690	102474990	C/T			
rs3755283	66228	102475528	A/G			
rs3755282	66982	102476282	A/G	0.293	0.268	0.452
rs1812326	72511	102481811	A/G	0.320	0.294	0.453
rs1558626	74170	102483470	A/T	0.541	untyped	
rs1558625	74264	102483564	C/T	0.694	0.719	0.473
rs1558624	74333	102483633	C/T	0.285	0.279	0.865
rs1558623	74502	102483802	A/T	0.277	0.261	0.615
rs1035131	74741	102484041	A/C	0.581	0.590	0.795
rs2110661	75321	102484621	C/T	0.405	0.414	0.800
rs1420093	82558	102491858	A/G	0.384	untyped	
rs3074971	85366	102494666	-TTG	0.488	0.469	0.619
rs1345302	85469	102494769	C/T	0.378	0.406	0.437
rs1420092	86485	102495785	G/T	0.769	0.768	0.980
rs1345301	87687	102496987	C/T	0.464	0.487	0.531
rs2310242	89463	102498763	G/T	0.120	untyped	
rs2310243	89660	102498960	A/G	0.537	0.514	0.548
rs1882510	95718	102505018	C/T	0.642	0.635	0.875
rs1882511	95821	102505121	A/G	0.639	0.644	0.871

[0238] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1B for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1B can be determined by consulting Table 13. For example, the left-most X on the left graph is at position 102409525. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0239] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial

regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter 8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black line provides a local test for excess statistical significance to identify regions of association. This was created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0240] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is placed at the 3' end of each gene to show the direction of transcription.

Example 5 WASPIP Region Proximal SNPs

[0241] It has been discovered that rs1465621 in the untranslated region (UTR) of the WASPIP gene is associated with occurrence of osteoarthritis in subjects. This gene encodes a protein that plays a role in actin cytoskeleton organization. The encoded protein binds to a region of Wiskott-Aldrich syndrome protein that is frequently mutated in Wiskott-Aldrich syndrome, an X-linked recessive disorder. Impairment of the interaction between these two proteins may contribute to the disease. Alternative transcript variants exist for this gene. Biological activity of WASPIP or a pathway member downstream of WASPIP (e.g., IL-2) can be modulated by addition of an antibody, a recombinant binding partner, a binding agent, or a recombinant WASPIP or downstream pathway member protein or functional fragment thereof.

[0242] Sixty-one additional allelic variants proximal to rs1465621 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 16. The chromosome positions provided in column four of Table 16 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 16

dbSNP rs#	Chromosome	Position in SEQ ID NO: 3	Chromosome Position	Allele Variants
rs1864455	2	209	175603909	C/T
rs1971763	2	5908	175609608	C/T
rs934269	2	7460	175611160	A/G
rs934270	2	7733	175611433	A/G
rs2033309	2	7855	175611555	A/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 3	Chromosome Position	Allele Variants
rs2033310	2	7904	175611604	A/C
rs934271	2	8869	175612569	G/T
rs934272	2	9480	175613180	C/T
rs1897110	2	13820	175617520	C/T
rs2033311	2	15152	175618852	A/G
rs1010027	2	17713	175621413	A/G
rs1010028	2	17804	175621504	C/T
rs2884502	2	18220	175621920	C/T
rs1430177	2	19083	175622783	C/T
rs1430178	2	19123	175622823	C/G
rs3043779	2	19605	175623305	-/GTAAA
rs1549742	2	20247	175623947	G/T
rs3043781	2	20592	175624292	-/CCCCC
rs2033313	2	21907	175625607	C/T
rs7739	2	23273	175626973	C/T
rs11482	2	23299	175626999	A/C
rs3087907	2	23623	175627323	G/T
rs2358888	2	23669	175627369	A/T
rs1046036	2	23844	175627544	A/T
rs3205060	2	24190	175627890	A/G
rs15327	2	24486	175628186	C/T
rs1430179	2	24896	175628596	A/C
rs1430180	2	25118	175628818	C/G
rs2163236	2	30551	175634251	C/G
rs3217351	2	30844	175634544	-/GAGA
rs2303891	2	30900	175634600	A/G
rs3815969	2	30942	175634642	A/G
rs2288622	2	31699	175635399	A/G
rs2288623	2	32081	175635781	G/T
rs1044335	2	35078	175638778	A/G
rs2288624	2	36196	175639896	A/T
rs1060511	2	36541	175640241	A/C
rs1367218	2	38356	175642056	A/G
rs1367217	2	45578	175649278	A/G
rs1465621	2	49634	175653334	A/T
rs1465622	2	49774	175653474	G/T
rs2115872	2	51119	175654819	A/G
rs1465623	2	51181	175654881	A/G
rs1469521	2	51652	175655352	C/T
rs1864451	2	54467	175658167	C/G
rs1430183	2	55762	175659462	A/G
rs1430182	2	55999	175659699	A/G
rs1430181	2	57865	175661565	A/C
rs1991601	2	66613	175670313	A/G
rs2358890	2	68377	175672077	C/T
rs2115875	2	69754	175673454	C/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 3	Chromosome Position	Allele Variants
rs1430185	2	72859	175676559	A/G
rs2217429	2	76512	175680212	A/G
rs3049909	2	76717	175680417	-A/T
rs1430184	2	77722	175681422	C/T
rs2278321	2	80998	175684698	A/G
rs2115874	2	82033	175685733	C/T
rs2033315	2	89658	175693358	C/T
rs2033314	2	89960	175693660	A/G
rs1991600	2	94155	175697855	A/G
rs1864453	2	95679	175699379	A/G

Assay for Verifying and Allelotyping SNPs

[0243] The methods used to verify and allelotype the 61 proximal SNPs of Table 16 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 17 and Table 18, respectively.

TABLE 17

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1864455	ACGTTGGATGCAGGTTGTCAGTGAATGTC	ACGTTGGATGTCAGCAGTTGTCCCATCTTC
rs1971763	ACGTTGGATGAATGATTACTTGAGGCCGG	ACGTTGGATGTCCTCAAACTCCTGACCTCTG
rs934269	ACGTTGGATGAAGTCCCTAGGACTACAGGT	ACGTTGGATGTGGGCCAATAGCAAGACCC
rs934270	ACGTTGGATGATGATCTGCCCTGTTCTGC	ACGTTGGATGAGGTGCAATCTACTCACCAG
rs2033309	ACGTTGGATGCCATAGCTTCTCTCACACAAC	ACGTTGGATGTTCTCCTTCAGACAAAGGTTG
rs2033310	ACGTTGGATGATGAGTCTCTGTGAGTTGAG	ACGTTGGATGTTGTGTGAGGAAGCTATGGC
rs934271	ACGTTGGATGCCTGAAATGCCAAGAAGAAATG	ACGTTGGATGATTCTCTGCTACATAGTCAGG
rs934272	ACGTTGGATGAGTCTTCTCTCTCTTCACAC	ACGTTGGATGACTAAAGGATTTTGGGTGCG
rs1897110	ACGTTGGATGTCAGCATCCCAAGTGCTAG	ACGTTGGATGTAAAAATCGGCTGGGTGTGG
rs2033311	ACGTTGGATGCGGGACTCTGTGTTAACAAAG	ACGTTGGATGGAGTTACAAAGATGCTGAGCC
rs1010027	ACGTTGGATGCGCCGTCTCTGTGTGAGAAG	ACGTTGGATGAATTCCTCTCTGACTCTTTC
rs1010028	ACGTTGGATGGTAACCTTAAGGCCCTCACAGC	ACGTTGGATGGACTGAAAGAGTCAGAGAGG
rs2884502	ACGTTGGATGGAAATCCCCATGTCAGAATC	ACGTTGGATGTGAACAGTACAAAGGAAGGG
rs1430177	ACGTTGGATGCCAGACCCCTGTCTCAAATA	ACGTTGGATGTGAGTACGTAGGAGTATAGG
rs1430178	ACGTTGGATGTATTTGAGACAGGGCTCTGGC	ACGTTGGATGTGAGCCCTGGAATTCAGAGC
rs3043779	ACGTTGGATGAGTTCTCTCACTACTGTTTG	ACGTTGGATGCCACATGATTTAATGGAGC
rs1549742	ACGTTGGATGTGAGACACTGTGCCATAGCTG	ACGTTGGATGGGTCCAGGTTTGTGATGTC
rs3043781	ACGTTGGATGATAATAATAGTTAGAAAGCC	ACGTTGGATGAGAAGCTAATTAAGCTCAAG
rs2033313	ACGTTGGATGAAGCCGTGCACTCACAAATC	ACGTTGGATGACCACTACAAAGCTTCTCGG
rs7739	ACGTTGGATGTGATGACACAGATAGCAAAATGTG	ACGTTGGATGTTCCCTCCTTATAGTCAAGGACC
rs11482	ACGTTGGATGAAATGTTGGCATGAAATAATTTT	ACGTTGGATGTGTCTGTTTACATAGTCATG
rs3087907	ACGTTGGATGGAACACTGAGTTTAAATACTG	ACGTTGGATGAATCAGAGCTACATGTGTG

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs2358888	ACGTTGGATGAATCAGAGCTTACATGTGTG	ACGTTGGATGGAGGTGAATGTTAAATACTG
rs1046036	ACGTTGGATGCAAAAGTTGCCATTATCCAG	ACGTTGGATGAGGGTGTAGGGTGATTAATG
rs3205060	ACGTTGGATGAAGCCAAACACTTGGCAAGC	ACGTTGGATGCTCTCTCTCTCTACCATTC
rs15327	ACGTTGGATGGGGTTGGTTTCTTGGTAGCA	ACGTTGGATGCCCTAAACATTGTATCATGGTTTCA
rs1430179	ACGTTGGATGAGACTAGGAAGGCTTGGTAG	ACGTTGGATGGGTTCCTCTCTCTCTCCATG
rs1430180	ACGTTGGATGCTTCAAAGTACCAAGGTCAG	ACGTTGGATGCAGGCTTTCATTTGTTTCC
rs2163236	ACGTTGGATGTTGAGTAGCCTGAGTGACAC	ACGTTGGATGTAGATGGCTCCAAAGGGTTC
rs3217351	ACGTTGGATGGTAACGAAAGGCACAGAATG	ACGTTGGATGTAGCACTTCCAGCTTTTCTG
rs2303891	ACGTTGGATGACCACAGACATCAGTGCTAG	ACGTTGGATGCAGTGACTAATTCGTGACC
rs3815969	ACGTTGGATGGAAGTGCTACAAAGGTCACG	ACGTTGGATGGCTGGATCCTAATCACTCTC
rs2288622	ACGTTGGATGGGCTGGAGCAAAAAAGAC	ACGTTGGATGCATCAGGCTGACACCAATGG
rs2288623	ACGTTGGATGGAAATTATTTAGGCTTTCAG	ACGTTGGATGTATACCTACACAGAACATGC
rs1044335	ACGTTGGATGCTACTCAGTGTCTCTCATCTC	ACGTTGGATGTTTAAAGTGCACACGACACG
rs2288624	ACGTTGGATGCATAGGCTGTAGAAGTTGGG	ACGTTGGATGTTGTTGGTCCCTTCTGGGAG
rs1060511	ACGTTGGATGCTCCCTATGAAGAGAAATGCC	ACGTTGGATGCTGATGGTCTTTTCTCTTTC
rs1367218	ACGTTGGATGTTGTGAGCCGCTTTTCAAAC	ACGTTGGATGCATGCAAAACACTTTTTCAG
rs1367217	ACGTTGGATGGAGCTGTAACTAAAAAGGGTG	ACGTTGGATGGTGTATATTGCCAAAGATGC
rs1465621	ACGTTGGATGTTCTCCTCCCATCTCTCTCTG	ACGTTGGATGGCGGGAGCTAAGGTAGATTG
rs1465622	ACGTTGGATGGGCTCTTGTAGTCTCCAAAC	ACGTTGGATGAGAATGTCAAGGTGAAAGAGC
rs2115872	ACGTTGGATGTAGACCGCCCACTTTGAATG	ACGTTGGATGAACACATGCTGGACTGTGTC
rs1465623	ACGTTGGATGGGATCCAGCAGATTCTCCAT	ACGTTGGATGAGTGGCGGGCTCTAGAAATG
rs1469521	ACGTTGGATGTGCTCCTAGGAGAGCTCTGA	ACGTTGGATGAGGACTGGGTGCCCTGTGTA
rs1864451	ACGTTGGATGCTGTATGTGAAACAAAGGCC	ACGTTGGATGTCTTTACTTGGTGTGTTGAC
rs1430183	ACGTTGGATGCATGTCTATTCTGTAGTGTGG	ACGTTGGATGTCTTGGGATCAAGAAAGTG
rs1430182	ACGTTGGATGAATGTGCTAAAGTAACCC	ACGTTGGATGATCTTTTGGGAAAAAGAAAG
rs1430181	ACGTTGGATGAAGCTCCTAGCCAGTCTTAG	ACGTTGGATGTTATTTGGCGGGAGTAGG
rs1991601	ACGTTGGATGATCCTCAACAGATCTGGTTC	ACGTTGGATGTCTGGTGATGGCTTGTGATC
rs2358890	ACGTTGGATGTCAGAGTAGAGTTACTCCAG	ACGTTGGATGCATGATGCAGCTATTCTGTG
rs2115875	ACGTTGGATGCGACACCCCTTTTCTAGATG	ACGTTGGATGACTATTTTGAAGTAGTGTG
rs1430185	ACGTTGGATGATCTGAGCCTAGACCTTAAC	ACGTTGGATGGGGAATGAATCAACAGTGC
rs2217429	ACGTTGGATGTGCACAAAATAGCCACAGC	ACGTTGGATGAGTGACCGCTTCTGTGTGTT
rs3049909	ACGTTGGATGCAAAAGCAGGAATGCCCTGG	ACGTTGGATGGGGTCAACAAGTGTGTTTTC
rs1430184	ACGTTGGATGAATATGCAATGGCTCTCTCC	ACGTTGGATGCCATAAAACACAGTTGCTCC
rs2278321	ACGTTGGATGCGACAGCAGGTAGATGAAC	ACGTTGGATGCTCTGAAAAGAGAGACAGCC
rs2115874	ACGTTGGATGCAGTGGACTTAAGAGAGGAG	ACGTTGGATGGGTTCACAGGTACCTGAAAGC
rs2033315	ACGTTGGATGGTCAAGGTAGTTGAGAGATT	ACGTTGGATGCAATGACAAAAAGCAATTTTC
rs2033314	ACGTTGGATGCATCTTCTTAATGGTCTTGG	ACGTTGGATGACGAGCTACATTCCTATG
rs1991600	ACGTTGGATGTTTCGTATCAGTCAGAAAGG	ACGTTGGATGCTGGTTCCTTTTGGGAG
rs1864453	ACGTTGGATGAGATAGGAATGACTGCCAAG	ACGTTGGATGAGGTGACTCTCATCTCTTTC

TABLE 18

dbSNP rs#	Extend Primer	Term Mix
--------------	------------------	-------------

dbSNP rs#	Extend Primer	Term Mix
rs1864455	TCCTTTCTCTCAGTTCCCC	ACT
rs1971763	AGCACTTTGGGAGCCAAGG	ACG
rs934269	GCACGCCACCACTCGG	ACG
rs934270	CCCTGTTCTTGCTCCTGCTTCTT	ACT
rs2033309	ACAACACAAGAAGGGTTGTTA	ACG
rs2033310	GGGTGGGAAATCTGCTGAG	ACT
rs934271	GCATAATTTTCAGGGAGGCAG	ACT
rs934272	TGCTTCTCTTCACACTTATAAG	ACG
rs1897110	GCATCCCAAGTGCTAGGATTACA	ACT
rs2033311	CTTCCAGGAGGTGCGATGAG	ACT
rs1010027	TCTGTTGTGAGAAGATGCCG	ACT
rs1010028	ACAGCTGTTGGGCTCACAG	ACT
rs2884502	TGCCTAGTTAATTTGCTTTCCT	ACT
rs1430177	CCCTGTCTCAATAAATTTTAAAA	ACT
rs1430178	GACAGGGTCTGGCTATGTTGTC	ACT
rs3043779	ACTGTTTGTGATGATTGTAATA	ACT
rs1549742	GCCTAGCTGGGGCTTCAAGTTA	CGT
rs3043781	TAGAAGCCAACCCCCCCC	ACT
rs2033313	CCCTGTGAGGCCATAGACAA	ACT
rs7739	CTGTTTACATAGTGATG	ACT
rs11482	CTTATAGTCAAGGACCCTG	CGT
rs3087907	CAATATAAAATAAGAGGTGAATGT	ACT
rs2358888	GCTTACATGTGTGTTTTT	CGT
rs1046036	CATTATCCAGAATAGATTGTTTT	CGT
rs3205060	TTTGCCAAGCTTGTGTTATA	ACG
rs15327	GGTAGCATCTCCAGTAA	ACG
rs1430179	GAGGGGAAAAAAGTCAGGAAAA	ACT
rs1430180	AAGTACCAAGGTGAGAAATGATT	ACT
rs2163236	AGTCCAGGCTTCTTGCCTG	ACT
rs3217351	AGGCACAGAATGAAAGAGAGA	ACT
rs2303891	TAGAAGTTTACAGAAAGCTGGAA	ACT
rs3815969	TTAGTACACTGACATATACAG	ACT
rs2288622	CTTACATCCACATTCCATTACC	ACT
rs2288623	TTTAGGTTCTTCAGAGAACAAG	ACT
rs1044335	GAAATATTGGTCCCCTTTCC	ACG
rs2288624	GACTCGCAGGTAAATAGAGCT	CGT
rs1060511	CCCCAAAAAGTGGAAAA	CGT
rs1367218	CTTTTCAACACGATGGAGCAC	ACT
rs1367217	AACTAAAAAGGGTGATTTCACTAT	ACT
rs1465621	CCATTCTTCTGACATTCGCC	CGT
rs1465622	CAAACATAAGGTTGACCCCC	CGT
rs2115872	TTTGAATGGGACTCTTCC	ACT
rs1465623	TCCATACATGAGAGCTGCTG	ACG

dbSNP rs#	Extend Primer	Term Mix
rs1469521	TAGGAGACGTCTGACTCCAA	ACT
rs1864451	GAAAACAAAGCCCTTTCTGTC	ACT
rs1430183	ATTCTGTAGTGTGGGCCCTA	ACT
rs1430182	GTAACCCCTAAATACTATCATAC	ACG
rs1430181	CTAGCCAGTCTTAGTGATGTT	CGT
rs1991601	AGCTCGCCTCAGCCTACAA	ACT
rs2358890	GTCCAGAACACCATAATCCG	ACT
rs2115875	TTTTTTCTAGATCAGCACTGTTCA	ACT
rs1430185	CTAGACCTTAACCTCAATTATA	ACG
rs2217429	AGTCCTTGGTTTATGAACATTG	ACT
rs3049909	TTTATGTTATGCACATGCAGAC	ACT
rs1430184	CATAAAACCAACTTATTATATCCC	ACG
rs2278321	GCTCACAGGCTTTGTAACATC	ACT
rs2115874	GGGGAGATCTGCCATCTCCTGG	ACT
rs2033315	GGTAGTTGAGAGTATTGTGAGA	ACG
rs2033314	GTCTTGTTTAAATATCACTCCT	ACT
rs1991600	TAAAGGGGAAAAAAGCTCTAA	ACT
rs1864453	CTGCCAAGTTGAATACTGAGTT	ACT

Genetic Analysis

[0244] Allelotyping results from the discovery cohort are shown for cases and controls in Table 19. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 ($A1\ AF = 1 - A2\ AF$). For example, the SNP rs1971763 has the following case and control allele frequencies: case A1 (C) = 0.456; case A2 (T) = 0.544; control A1 (C) = 0.444; and control A2 (T) = 0.556, where the nucleotide is provided in parenthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 19

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1864455	209	175603909	C/T			
rs1971763	5908	175609608	C/T	0.544	0.556	0.630
rs934269	7460	175611160	A/G			
rs934270	7733	175611433	A/G			
rs2033309	7855	175611555	A/G	0.158	0.172	0.502
rs2033310	7904	175611604	A/C	0.428	0.423	0.845
rs934271	8869	175612569	G/T			
rs934272	9480	175613180	C/T			
rs1897110	13820	175617520	C/T			
rs2033311	15152	175618852	A/G			

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1010027	17713	175621413	A/G			
rs1010028	17804	175621504	C/T	0.448	0.449	0.965
rs2884502	18220	175621920	C/T			
rs1430177	19083	175622783	C/T	0.051	0.309	-0.0001
rs1430178	19123	175622823	C/G			
rs3043779	19605	175623305	-GTAAA			
rs1549742	20247	175623947	G/T			
rs3043781	20592	175624292	-CCCCC			
rs2033313	21907	175625607	C/T			
rs7739	23273	175626973	C/T	0.057	0.042	0.371
rs11482	23299	175626999	A/C	0.934	0.935	0.958
rs3087907	23623	175627323	G/T	0.427	0.425	0.918
rs2358888	23669	175627369	A/T	0.083	0.064	0.245
rs1046036	23844	175627544	A/T			
rs3205060	24190	175627890	A/G	0.478	0.483	0.859
rs15327	24486	175628186	C/T	0.901	0.917	0.336
rs1430179	24896	175628596	A/C			
rs1430180	25118	175628818	C/G			
rs2163236	30551	175634251	C/G	0.956	0.955	0.994
rs3217351	30844	175634544	-GAGA	0.481	0.487	0.823
rs2303891	30900	175634600	A/G	0.750	0.687	0.006
rs3815969	30942	175634642	A/G	0.232	0.239	0.771
rs2288622	31699	175635399	A/G	0.863	0.828	0.082
rs2288623	32081	175635781	G/T	0.081	0.106	0.134
rs1044335	35078	175638778	A/G	0.105	0.115	0.560
rs2288624	36196	175639896	A/T	0.901	0.871	0.117
rs1060511	38541	175640241	A/C	0.968	0.979	0.413
rs1367218	38356	175642056	A/G	0.931	0.958	0.068
rs1367217	45578	175649278	A/G	0.027	0.020	0.648
rs1465621	49634	175653334	A/T			
rs1465622	49774	175653474	G/T	0.084	0.108	0.161
rs2115872	51119	175654819	A/G	0.483	0.500	0.500
rs1465623	51181	175654881	A/G			
rs1469521	51652	175655352	C/T	0.433	0.435	0.953
rs1864451	54467	175658167	G/G	0.316	0.315	0.970
rs1430183	55762	175659462	A/G	0.972	0.970	0.930
rs1430182	55999	175659699	A/G	0.711	0.691	0.366
rs1430181	57865	175661565	A/C	0.939	0.943	0.836
rs1991601	66613	175670313	A/G	0.754	0.713	0.062
rs2358890	68377	175672077	C/T	0.404	0.443	0.109
rs2115875	69754	175673454	C/T	0.633	0.620	0.613
rs1430185	72859	175676559	A/G	0.768	0.750	0.445
rs2217429	76512	175680212	A/G	0.428	0.489	0.028
rs3049909	76717	175680417	-AT	0.161	0.200	0.064
rs1430184	77722	175681422	C/T	0.025	untyped	NA
rs2278321	80998	175684698	A/G			
rs2115874	82033	175685733	C/T	0.729	0.698	0.179
rs2033315	89658	175693358	C/T	0.649	0.663	0.542
rs2033314	89960	175693660	A/G	0.697	0.692	0.835
rs1991600	94155	175697855	A/G	0.526	0.576	0.048
rs1864453	95679	175699379	A/G	0.675	0.672	0.883

[0245] The *WASPIP* proximal SNPs were also allelotyped in the replication cohorts using the methods described herein and the primers provided in Tables 17 and 18. The replication allelotyping results for replication cohort #1 and replication cohort #2 are provided in Tables 20 and 21, respectively.

TABLE 20

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1864455	209	175603909	C/T			
rs1971763	5908	175609608	C/T	0.472	0.509	0.276
rs934269	7460	175611160	A/G			
rs934270	7733	175611433	A/G			
rs2033309	7855	175611555	A/G	0.179	0.186	0.784
rs2033310	7904	175611604	A/G	0.428	0.405	0.493
rs934271	8869	175612569	G/T			
rs934272	9480	175613180	C/T			
rs1897110	13820	175617520	C/T			
rs2033311	15152	175618852	A/G			
rs1010027	17713	175621413	A/G			
rs1010028	17804	175621504	C/T	0.447	0.465	0.579
rs2884502	18220	175621920	C/T			
rs1430177	19083	175622783	C/T	0.051	0.098	0.138
rs1430178	19123	175622823	C/G			
rs3043779	19605	175623305	-/GTAAA			
rs1549742	20247	175623947	G/T			
rs3043781	20592	175624292	-/CCCCC			
rs2033313	21907	175625607	C/T			
rs7739	23273	175626973	C/T	0.076	0.053	0.342
rs11482	23299	175626999	A/C	0.919	0.919	0.996
rs3087907	23623	175627323	G/T	0.422	0.390	0.348
rs2358888	23669	175627369	A/T	0.104	0.074	0.204
rs1046036	23844	175627544	A/T			
rs3205060	24190	175627890	A/G	0.501	0.472	0.391
rs15327	24486	175628186	C/T	0.883	0.904	0.370
rs1430179	24896	175628596	A/C			
rs1430180	25118	175628818	C/G			
rs2163236	30551	175634251	C/G	0.976	untyped	0.921
rs3217351	30844	175634544	-/GAGA	0.514	0.480	0.329
rs2303891	30900	175634600	A/G	0.780	0.699	0.009
rs3815969	30942	175634642	A/G	0.183	0.213	0.426
rs2288622	31699	175635399	A/G	0.856	0.818	0.201
rs2288623	32081	175635781	G/T	0.083	0.112	0.216
rs1044335	35078	175638778	A/G	0.113	0.115	0.959
rs2288624	36196	175639896	A/T	0.908	0.872	0.215
rs1060511	36541	175640241	A/C	0.971	untyped	0.945
rs1367218	38356	175642056	A/G	0.952	0.947	0.824
rs1367217	45578	175649278	A/G	0.020	untyped	NA
rs1465621	49634	175653334	A/T			
rs1465622	49774	175653474	G/T	0.077	0.118	0.108
rs2115872	51119	175654819	A/G	0.493	0.499	0.861
rs1465623	51181	175654881	A/T			
rs1469521	51652	175655352	C/T	0.453	0.427	0.436
rs1864451	54467	175659167	C/G	0.302	0.321	0.556
rs1430183	55762	175659462	A/G	0.959	0.962	0.903
rs1430182	55999	175659699	A/G	0.727	0.678	0.114

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1430181	57865	175661565	A/C	0.942	0.940	0.943
rs1991601	66613	175670313	A/G	0.773	0.722	0.081
rs2358890	68377	175672077	C/T	0.389	0.443	0.111
rs2115875	69754	175673454	C/T	0.639	0.601	0.267
rs1430185	72859	175676559	A/G	0.790	0.774	0.586
rs2217429	76512	175680212	A/G	0.412	0.504	0.029
rs3049909	76717	175680417	-/AT	0.144	0.193	0.079
rs1430184	77722	175681422	C/T			
rs2278321	80998	175684698	A/G			
rs2115874	82033	175685733	C/T	0.744	0.703	0.169
rs2033315	89658	175693358	C/T	0.675	0.695	0.533
rs2033314	89960	175693660	A/G	0.726	0.703	0.529
rs1991600	94155	175697855	A/G	0.467	0.566	0.005
rs1864453	95679	175699379	A/G	0.702	0.680	0.468

TABLE 21

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1864455	209	175603909	C/T			
rs1971763	5908	175609608	C/T	0.635	0.629	0.879
rs934269	7460	175611160	A/G			
rs934270	7733	175611433	A/G			
rs2033309	7855	175611555	A/G	0.131	0.149	0.576
rs2033310	7904	175611604	A/C	0.428	0.452	0.548
rs934271	8869	175612569	G/T			
rs934272	9480	175613180	C/T			
rs1897110	13820	175617520	C/T			
rs2033311	15152	175618852	A/G			
rs1010027	17713	175621413	A/G			
rs1010028	17804	175621504	C/T	0.449	0.424	0.503
rs2884502	18220	175621920	C/T			
rs1430177	19083	175622783	C/T	untyped	0.642	NA
rs1430178	19123	175622823	C/G			
rs3043779	19605	175623305	-/GTAA			
rs1549742	20247	175623947	G/T			
rs3043781	20592	175624292	-/CCCC			
rs2033313	21907	175625607	C/T			
rs7739	23273	175626973	C/T	0.032	0.023	0.700
rs11482	23299	175626999	A/C	0.953	0.960	0.743
rs3087907	23623	175627323	G/T	0.435	0.479	0.295
rs2358888	23669	175627369	A/T	0.055	0.048	0.731
rs1046036	23844	175627544	A/T			
rs3205060	24190	175627890	A/G	0.449	0.500	0.197
rs15327	24486	175628186	C/T	0.923	0.937	0.552
rs1430179	24896	175628596	A/C			
rs1430180	25118	175628818	C/G			
rs2163236	30551	175634251	C/G	0.923	untyped	
rs3217351	30844	175634544	-/GAGA	0.439	0.496	0.125
rs2303891	30900	175634600	A/G	0.712	0.667	0.208
rs3815969	30942	175634642	A/G	0.294	0.281	0.705
rs2288622	31699	175635399	A/G	0.872	0.843	0.309
rs2288623	32081	175635781	G/T	0.078	0.096	0.444

dbSNP rs#	Position in SEQ ID NO: 3	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1044335	35078	175638778	A/G	0.094	0.117	0.366
rs2288624	36196	175639896	A/T	0.894	0.869	0.356
rs1060511	36541	175640241	A/C			
rs1367218	38356	175642056	A/G	0.903	0.976	0.001
rs1367217	45578	175649278	A/G	0.035	0.021	0.504
rs1465621	49634	175653334	A/T			
rs1465622	49774	175653474	G/T	0.092	0.093	0.959
rs2115872	51119	175654819	A/G	0.471	0.502	0.397
rs1465623	51181	175654881	A/G			
rs1469521	51652	175655352	C/T	0.408	0.447	0.282
rs1864451	54467	175658167	C/G	0.334	0.306	0.420
rs1430183	55762	175659462	A/G			
rs1430182	55999	175659699	A/G	0.691	0.711	0.547
rs1430181	57865	175661565	A/C	0.936	0.946	0.651
rs1991601	66613	175670313	A/G	0.730	0.700	0.372
rs2358890	68377	175672077	C/T	0.423	0.444	0.566
rs2115875	69754	175673454	C/T	0.625	0.650	0.510
rs1430185	72859	175676559	A/G	0.740	0.714	0.462
rs2217429	76512	175680212	A/G	0.447	0.464	0.644
rs3049909	76717	175680417	-A/T	0.184	0.212	0.386
rs1430184	77722	175681422	C/T			
rs2278321	80998	175684698	A/G			
rs2115874	82033	175685733	C/T	0.709	0.691	0.605
rs2033315	89658	175693358	C/T	0.616	0.614	0.962
rs2033314	89960	175693660	A/G	0.660	0.674	0.679
rs1991600	94155	175697855	A/G	0.602	0.590	0.749
rs1864453	95679	175699379	A/G	0.641	0.659	0.631

[0246] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1C for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1C can be determined by consulting Table 19. For example, the left-most X on the left graph is at position 175603909. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0247] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter

8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black line provides a local test for excess statistical significance to identify regions of association. This was created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0248] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is place at the 3' end of each gene to show the direction of transcription.

Example 6 LOXL1 Region Proximal SNPs

[0249] It has been discovered that rs8818 in the untranslated region (UTR) of the lysyl oxidase-like 1 (LOXL1) gene is associated with occurrence of osteoarthritis in subjects. LOXL1 is a Lysyl oxidase-like protein that catalyzes the cross-linking of collagen via lysine residues. Deficiency of the related protein, lysyl oxidase, causes a form of Ehlers-Danlos syndrome. LOXL1 likely is a secreted protein and its biological activity may be modulated by addition of an antibody, a recombinant binding partner, a binding agent, or a recombinant LOXL1 protein or functional fragment thereof.

[0250] Fifty-eight additional allelic variants proximal to rs912428 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 22. The chromosome positions provided in column four of Table 22 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 22

dbSNP rs#	Chromosome	Position in SEQ ID NO: 5	Chromosome Position	Allele Variants
rs1048661	15	213	71935363	G/T
rs3825942	15	249	71935399	C/T
rs1550436	15	1824	71936974	C/T
rs1550438	15	2057	71937207	C/T
rs1550439	15	2306	71937456	A/T
rs2165241	15	2869	71938019	C/T
rs1550433	15	3976	71939126	A/C
rs3056314	15	4288	71939438	-/TC
rs2415204	15	4290	71939440	A/C
rs1992314	15	4434	71939584	C/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 5	Chromosome Position	Allele Variants
rs1440101	15	5298	71940448	A/G
rs2289414	15	5467	71940617	A/G
rs2415205	15	8486	71943636	C/G
rs2899807	15	8487	71943637	A/T
rs893815	15	8831	71943981	C/G
rs3056342	15	9036	71944186	-/AG
rs4077284	15	9058	71944208	A/G
rs893816	15	9131	71944281	C/T
rs893817	15	9732	71944882	A/G
rs893818	15	9862	71945012	A/G
rs893819	15	10191	71945341	A/G
rs893820	15	10270	71945420	C/T
rs2304719	15	16167	71951317	C/T
rs1001507	15	17620	71952770	G/T
rs1530167	15	17751	71952901	C/T
rs1530168	15	17764	71952914	C/T
rs1530169	15	17787	71952937	C/T
rs2304720	15	19401	71954551	C/T
rs2304721	15	21021	71956171	A/C
rs893821	15	21902	71957052	C/T
rs750460	15	22173	71957323	C/T
rs2304722	15	22416	71957566	C/T
rs1440102	15	22653	71957803	A/G
rs8818	15	24945	71960095	C/G
rs3522	15	25011	71960161	C/T
rs2415206	15	28563	71963713	C/T
rs1984526	15	48574	71983724	C/G
rs1984525	15	48710	71983860	C/T
rs3031653	15	48880	71984030	-/TTG
rs2415187	15	50194	71985344	C/T
rs2507	15	56343	71991493	A/G
rs2289411	15	56455	71991605	C/T
rs3202077	15	56729	71991879	C/T
rs2289412	15	56759	71991909	A/G
rs2289413	15	56895	71992045	A/G
rs1061082	15	57036	71992186	C/G
rs2277600	15	57702	71992852	C/G
rs734854	15	62515	71997665	C/T
rs2415188	15	62629	71997779	C/G
rs3214695	15	63501	71998651	-/C
rs3816197	15	63547	71998697	C/T
rs3816198	15	64876	72000026	C/G
rs2304715	15	65073	72000223	C/G
rs2301272	15	67149	72002299	C/T
rs2301273	15	67549	72002699	C/T
rs3784563	15	71660	72006810	A/C

dbSNP rs#	Chromosome	Position in SEQ ID NO: 5	Chromosome Position	Allele Variants
rs3784561	15	71906	72007056	C/T
rs3784560	15	71911	72007061	A/C

Assay for Verifying and Allelotyping SNPs

[0251] The methods used to verify and allelotype the 58 proximal SNPs of Table 22 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 23 and Table 24, respectively.

TABLE 23

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1048661	ACGTTGGATGTTGCTGGGAGACGGAGGTG	ACGTTGGATGATTCCGGCTTTGGCCAGGTGC
rs3825942	ACGTTGGATGTAGGTGCTGGCGAAGGCCGAA	ACGTTGGATGACCTCCGCTCCCAGCAAC
rs1130133	ACGTTGGATGACCAAGTCAGGGAGACCCGC	ACGTTGGATGAGCGGAACGGCGCGCAGCA
rs1550436	ACGTTGGATGGCCAAAAAACTCAGTAACG	ACGTTGGATGGTTCATTACAGATAGTTTTGC
rs1550437	ACGTTGGATGTTGGGCCCTCCCAAGAGGAG	ACGTTGGATGAGAGCCCCAGCTGTGGACA
rs1550438	ACGTTGGATGAGTCAGGCCCTTGTACAGTA	ACGTTGGATGCATGAGGACACAGTGGAAAG
rs1550439	ACGTTGGATGATTCTCTGCTCCCATTTGAG	ACGTTGGATGTATACCTGAGGCACGTGGAG
rs2165241	ACGTTGGATGTAGAAGCCCACTGACTTGG	ACGTTGGATGGGGCAGAGAAAACCTGAGCTC
rs1550433	ACGTTGGATGATAGCAGGAGTGGTCACATC	ACGTTGGATGTAGCAATCCTTGAAGAGAG
rs3056314	ACGTTGGATGTCCTCTGCTGGCCCTCTGATTG	ACGTTGGATGCCTGACGCTGTGCTCCTATC
rs2415204	ACGTTGGATGGTCTCTCTGCTGGCCCTCTGAT	ACGTTGGATGCCGTGACGCTGTGCTCCTATC
rs1992314	ACGTTGGATGTTTGCTCTAAAGGCCCTGAG	ACGTTGGATGAGATAAACCCCTGCAGCTCG
rs1440101	ACGTTGGATGAAAAGTCAGCAAGTGAGCTC	ACGTTGGATGTTTAATTCGCCAGGTCTTAGCC
rs2289414	ACGTTGGATGTTGCTTATCTGTACACCTC	ACGTTGGATGCTCAACCTGTGCACACCACT
rs2415205	ACGTTGGATGTGATGCTTCACTTCACTCCAG	ACGTTGGATGTGTGGCGCAGCTAAGTTTTG
rs2899807	ACGTTGGATGTGATGCTTCAGTTACTCCAG	ACGTTGGATGTGTGGGCGAGCGTAAGTTTTG
rs893815	ACGTTGGATGCACCCCTTTACAGCACTCAC	ACGTTGGATGATCCCTCTGTGAGTCAAGC
rs3056342	ACGTTGGATGTAAGGATCAGTAGGCAAGTGC	ACGTTGGATGATAGCTGGGAATTCAGGAC
rs4077284	ACGTTGGATGTAAGGATCAGTAGGCAAGTGC	ACGTTGGATGATAGCTGGGAATTCAGGAC
rs893816	ACGTTGGATGATTGCCCAAGCAATCAAGCC	ACGTTGGATGTTCTGGAAGGCTAGGTAAGG
rs893817	ACGTTGGATGAAAACAGGTGAGGTGTGGACG	ACGTTGGATGAGAAATCTGTTCCCTCCTGC
rs893818	ACGTTGGATGTTTATAGGAGCTGTTCACTTC	ACGTTGGATGTGGGAGAATTCTGACTGC
rs893819	ACGTTGGATGCTGTCACTGACTCTTGGG	ACGTTGGATGATGGTCTTTGTCTCCCGTT
rs893820	ACGTTGGATGAGAGCTCAGTGTGACAGGTTTC	ACGTTGGATGTTCTATATCCTGGCTCTGCC
rs2304719	ACGTTGGATGTTTATCAGTAGGCTTGGCC	ACGTTGGATGCCCTGTATAGTAGGATACAG
rs1001507	ACGTTGGATGAGAACTCTGCAAACTGGAG	ACGTTGGATGTGCAGCATGTGAACCTGGCAC
rs1530167	ACGTTGGATGAAACACTCCTTCCCTCTG	ACGTTGGATGGCCTAGAACCTAGACCCCTTA
rs1530168	ACGTTGGATGCAAAACATCCTCCTCCCTC	ACGTTGGATGAGACCTTATGTTTCCCATG
rs1530169	ACGTTGGATGTGCTGCTGAGCTGAACAGAAG	ACGTTGGATGGGAATCTGTCTATGCTGGG
rs2304720	ACGTTGGATGATGCTGGGTCTGGTGTAC	ACGTTGGATGATAGTGTGCTGACAGGAGC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs2304721	ACGTTGGATGCTCAAGTGATGCCTCAGATG	ACGTTGGATGCTGAAAGAGCTTCAGCCTC
rs893821	ACGTTGGATGTGGATTAACAGGGTAGGGC	ACGTTGGATGGAAGTTGGATCCCTGCATC
rs750480	ACGTTGGATGATGTTCCCTAGAGCTAGAG	ACGTTGGATGCTCAGCTCCTCATTAATGCA
rs2304722	ACGTTGGATGTTACCACTTCTCTGGTGAG	ACGTTGGATGAGGGAAGAGAGAAACAGGG
rs1440102	ACGTTGGATGAGTAAGAGTTGCCACCAC	ACGTTGGATGTGACCTAAAGTGCAGGTATC
rs8818	ACGTTGGATGAATCTCTCCCTTCCAAAGC	ACGTTGGATGTCCTGTGGTTTTATCCAC
rs3522	ACGTTGGATGAACCAACTGTAGAGAAAAGTGAA	ACGTTGGATGACGTGGATGAAAACCCACAGG
rs2415206	ACGTTGGATGCACCTTGAGGTGAACAGAC	ACGTTGGATGTTACTTAGTAGACCCCGAGG
rs1984526	ACGTTGGATGATCCCTTTGTTCTTGAACAG	ACGTTGGATGGGATTACAAACGTGAGCCAC
rs1984525	ACGTTGGATGCAGCTGGGATTACAGGTATG	ACGTTGGATGACCAACATGGTGAACCCCTG
rs3031653	ACGTTGGATGATAAAGCTTAAAGCTCAGTTG	ACGTTGGATGAAAAAAAAGTGAAAGTCG
rs2415187	ACGTTGGATGTTCTATGAGTTACTTGACAC	ACGTTGGATGTGTCTTTATCTGACTAGTG
rs2507	ACGTTGGATGGCTGCTCCCAAGATTCTG	ACGTTGGATGTAAGAAGCAGACAACGCAGG
rs2289411	ACGTTGGATGCTGTGGCGAAGTTACCTGGG	ACGTTGGATGTGCTGCTTCCCATGCCAAT
rs3202077	ACGTTGGATGACAGTGGTTCTCTGGACAAG	ACGTTGGATGTCTCCTCTGGGAATCACACC
rs2289412	ACGTTGGATGGGACAAAGCCTTGTCCAGAG	ACGTTGGATGATGAATGGAGGCTGCAGGAG
rs2289413	ACGTTGGATGTTGGCTGACTTCCAGAGCC	ACGTTGGATGTGCAGATGAACACCTCCTCC
rs1061082	ACGTTGGATGGCCCTGCTATGCAGAGAG	ACGTTGGATGAGGTCGCCCTTCACTTCAG
rs2277600	ACGTTGGATGTAGTGAGGTCCAGGAAGTAG	ACGTTGGATGCCGTGCTACCAAGTTCAATGTC
rs734854	ACGTTGGATGATAACTCCAAGGCCATGTG	ACGTTGGATGCAGACCACAGAGATGAAAAG
rs2415188	ACGTTGGATGAAAGTTGACAAAGCCCTTTC	ACGTTGGATGAGGAACTGTCTGCTTGG
rs3214695	ACGTTGGATGACACTTGCACCAAGTTCACCTC	ACGTTGGATGTACATCTGCCAGTGAGAGCA
rs3816197	ACGTTGGATGGTGAACCTTGGGCAAGTGTAC	ACGTTGGATGAGATTGAGAGCCCTGAGAAG
rs3816198	ACGTTGGATGTAGGGTCATGGGGCTTTGG	ACGTTGGATGGGCTGATAAGAGCCGAGGAC
rs2304715	ACGTTGGATGGTGAAGTGGCCGCTGGCAC	ACGTTGGATGTCTCGGAGGCGAGATTTCG
rs2301272	ACGTTGGATGATGATACCAAGGAGTGTGC	ACGTTGGATGTGACCAACTTCCCATCACTC
rs2301273	ACGTTGGATGACCTACCGCTGACTTACGG	ACGTTGGATGACGGATGAATGGATCAAAG
rs3784563	ACGTTGGATGAATGTGGTCTGCAGATATGC	ACGTTGGATGAAACTTACTATCCACCTGCG
rs3784561	ACGTTGGATGATGACCACAATTATGCTGC	ACGTTGGATGTGCAAGAGATGATTCTGCAGC
rs3784561	ACGTTGGATGCAGTAAGGCTGGATTCTAGG	ACGTTGGATGGCTGCCTGTGTTAATGGTT
rs3784560	ACGTTGGATGGCTGGATTCTAGGATCAGAG	ACGTTGGATGACATTCTCAGATAGCGCTGC

TABLE 24

dbSNP rs#	Extend Primer	Term Mix
rs1048661	GGAGACGGAGGTGCGGGCC	CGT
rs3825942	GAGACCGAGGAGCGGAG	ACG
rs1130133	GGCCGGTACACGCTGCC	ACG
rs1550436	AAAAAAGCTCAGTAACGGAGATAA	ACT
rs1550437	TTACCCCTTGAAAAAGCCAGA	ACT
rs1550438	GTAGCCCTGTCTGCTAACAGCAT	ACT
rs1550439	CTCCCCATTGAGGTTGCTG	CGT
rs2165241	CCAGGCATGCCTCGCCA	ACT

dbSNP rs#	Extend Primer	Term Mix
rs1550433	GGTCACATCGAGGGAGCC	ACT
rs3056314	TGGCCTCTGATTGGCCATG	ACT
rs2415204	CTCCTGGCCTCTGATTGGCCA	ACT
rs1992314	AAGGCCCTGAGGAGCTACA	ACT
rs1440101	CTCGTCACACATCTGTAACA	ACG
rs2289414	TTTATTCACTATTCAATTGGTC	ACT
rs2415205	CTCAGGCCCTGCACAGTGA	ACT
rs2899807	CTCAGGCCCTGCACAGTG	CGT
rs893815	ACAGCACTCACCTGTCCAC	ACT
rs3056342	CACACCCCAACCTTTTTACCCC	ACT
rs4077284	GGCAGGTCTCTGGCAGCA	ACG
rs893816	CAGAGTGGCAGCTAAAGCC	ACT
rs893817	GGTGTGGACGAGCAATGGGAA	ACT
rs893818	AGCCCTCTCACAAACCCTACAGA	ACG
rs893819	CACCTGTCTCTCTGCTCAA	ACG
rs893820	ACAGGTTCTCTCTACTGTGC	ACG
rs2304719	CAGGAGGGGAGGGGAGCAAG	ACG
rs1001507	GGCCCTCTGAGATCATTTCAA	ACT
rs1530167	CTGTTCAAGTCAGCAGACC	ACT
rs1530168	CAGTTAAATCCTGCCCTTCTGTTT	ACT
rs1530169	TGAACAGAAGGGCAGGATTTAAC	ACG
rs2304720	TGTGCCCCAACCCCCC	ACG
rs2304721	TCAGATGCTGCCCTCTGCTC	ACT
rs893821	GCCAGCTTTATTTGCGAACAATCT	ACT
rs750460	CAGAGAGGTTGGATCTCGCC	ACG
rs2304722	CTCTGGTGAGCAGTTGAGG	ACG
rs1440102	GCAGGCAAGGCCACCTGA	ACT
rs8818	AGCCCCCAACCCACAGGCA	ACT
rs3522	TATAAAATGGGGTCTGGC	ACT
rs2415206	GAAACAGACCCCCACCCC	ACG
rs1984526	AGCATAAAGGTGAAAGATGGGCC	ACT
rs1984525	GGATTACAGGTATGCACCA	ACG
rs3031653	AAGCTCAGTTGTGGCTCCTCAACAA	ACT
rs2415187	TCITTTTTAAAACTACACCAGGT	ACG
rs2507	TGACTCATCTGCCAGCTC	ACG
rs2289411	GGGATCTGGGCTGGCCC	ACT
rs3202077	CTGGACAAGGCTTTGTCCAT	ACG
rs2289412	GCCTTGTCCAGAGAACCACT	ACT
rs2289413	CAAGCCTGGCACCAAGCC	ACG
rs1061082	CTATGCAGAGAGCTGCGGC	ACT
rs2277600	GGAAGTAGGCGCTTTGGGTG	ACT
rs734854	ACTCCAAAGGCCATGTGCTTAAAC	ACG
rs2415188	GGGGTGCTGTTAGGCGAGCC	ACT

dbSNP rs#	Extend Primer	Term Mix
rs3214695	CGCTTGGCAGCTGTCGTG	ACT
rs3816197	CTTGGGCAAGTGACCTACG	ACG
rs3816198	CCCCAGAGCCAGCCAGC	ACT
rs2304715	CCGCCTGGCACGGCGGA	ACT
rs2301272	TGTGCTAGGACAAGATCCTAGGT	ACT
rs2301273	GCTGACTTACGGTAAAGCGG	ACT
rs3784563	TGACCACAATTTATGCTGCCA	ACT
rs3784561	GCAGGTGGATAGTAAGTTTCCA	ACT
rs3784561	GCTGGATTCTAGGATCAGAGACA	ACT
rs3784560	CTAGGATCAGAGACAGGTAG	ACT

Genetic Analysis

[0252] Allelotyping results from the discovery cohort are shown for cases and controls in Table 25. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 (A1 AF = 1-A2 AF). For example, the SNP rs1048661 has the following case and control allele frequencies: case A1 (G) = 0.725; case A2 (T) = 0.275; control A1 (G) = 0.767; and control A2 (T) = 0.233, where the nucleotide is provided in paranthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 25

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1048661	213	71935363	G/T	0.275	0.233	0.077
rs3825942	249	71935399	C/T	0.107	0.148	0.056
rs1550436	1824	71936974	C/T	0.401	0.420	0.470
rs1550438	2057	71937207	C/T			
rs1550439	2306	71937456	A/T			
rs2165241	2869	71938019	C/T	0.427	0.430	0.883
rs1550433	3976	71939126	A/C			
rs3056314	4288	71939438	-T/C			
rs2415204	4290	71939440	A/C	0.176	0.177	0.982
rs1992314	4434	71939584	C/G	0.599	0.601	0.938
rs1440101	5298	71940448	A/G			
rs2289414	5467	71940617	A/G			
rs2415205	8486	71943636	C/G			
rs2899807	8487	71943637	A/T	0.951	0.956	0.863
rs893815	8831	71943981	C/G			
rs3056342	9036	71944186	-A/G	0.290	0.292	0.927
rs4077284	9058	71944208	A/G	0.358	0.358	0.985
rs893816	9131	71944281	C/T	0.517	0.515	0.928
rs893817	9732	71944882	A/G	0.162	0.158	0.819
rs893818	9862	71945012	A/G	0.311	0.313	0.920

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs893819	10191	71945341	A/G	0.637	0.642	0.866
rs893820	10270	71945420	C/T	0.901	0.910	0.605
rs2304719	16167	71951317	C/T	0.320	0.299	0.387
rs1001507	17620	71952770	G/T	0.910	0.916	0.709
rs1530167	17751	71952901	C/T			
rs1530168	17764	71952914	C/T			
rs1530169	17787	71952937	C/T	0.209	0.203	0.779
rs2304720	19401	71954551	C/T	0.942	0.947	0.724
rs2304721	21021	71956171	A/C	0.798	0.814	0.519
rs893821	21902	71957052	C/T	0.113	0.116	0.879
rs750460	22173	71957323	C/T	0.473	0.438	0.176
rs2304722	22416	71957566	C/T	0.744	0.747	0.926
rs1440102	22653	71957803	A/G			
rs8818	24945	71960095	C/G			
rs3522	25011	71960161	C/T	0.424	0.441	0.472
rs2415206	28563	71963713	C/T	0.376	0.366	0.731
rs1984526	48574	71983724	C/G	0.593	untyped	NA
rs1984525	48710	71983860	C/T			
rs3031653	48880	71984030	-/TTG			
rs2415187	50194	71985344	C/T			
rs2507	56343	71991493	A/G	0.655	0.653	0.924
rs2289411	56455	71991605	C/T			
rs3202077	56729	71991879	C/T			
rs2289412	56759	71991909	A/G	0.971	0.968	0.855
rs2289413	56895	71992045	A/G	0.972	0.972	0.997
rs1061082	57036	71992186	C/G			
rs2277600	57702	71992852	C/G			
rs734854	62515	71997665	C/T	0.381	0.379	0.915
rs2415188	62629	71997779	C/G	0.532	0.538	0.832
rs3214695	63501	71998651	-/C	0.308	0.300	0.751
rs3816197	63547	71998697	C/T	0.327	0.311	0.512
rs3816198	64876	72000026	C/G	0.598	0.584	0.575
rs2304715	65073	72000223	C/G	0.660	0.643	0.534
rs2301272	67149	72002299	C/T	0.974	0.972	0.853
rs2301273	67549	72002699	C/T	0.952	0.966	0.409
rs3784563	71660	72006810	A/C	0.495	0.508	0.590
rs3784561	71906	72007056	C/T	0.470	0.466	0.872
rs3784560	71911	72007061	A/C			

[0253] The *LOXL1* proximal SNPs were also allelotyped in the replication cohorts using the methods described herein and the primers provided in Tables 23 and 24. The replication allelotyping results for replication cohort #1 and replication cohort #2 are provided in Tables 26 and 27, respectively.

TABLE 26

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1048661	213	71935363	G/T	0.250	0.252	0.953
rs3825942	249	71935399	C/T	0.126	0.141	0.539
rs1550436	1824	71936974	C/T	0.397	0.405	0.845

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1550438	2057	71937207	C/T			
rs1550439	2306	71937456	A/T			
rs2165241	2869	71938019	C/T	0.429	0.425	0.894
rs1550433	3976	71939126	A/C			
rs3056314	4288	71939438	-T/C			
rs2415204	4290	71939440	A/C	0.162	untyped	0.176
rs1992314	4434	71939584	C/G	0.583	0.594	0.756
rs1440101	5298	71940448	A/G			
rs2289414	5467	71940617	A/G			
rs2415205	8486	71943636	C/G			
rs2899807	8487	71943637	A/T	0.939	untyped	NA
rs893815	8831	71943981	C/G			
rs3056342	9036	71944186	-A/G	0.317	0.311	0.846
rs4077284	9058	71944208	A/G	0.372	0.365	0.881
rs893816	9131	71944281	C/T	0.510	0.518	0.793
rs893817	9732	71944882	A/G	0.178	0.170	0.784
rs893818	9862	71945012	A/G	0.327	0.320	0.818
rs893819	10191	71945341	A/G	0.610	untyped	NA
rs893820	10270	71945420	C/T	0.874	0.903	0.218
rs2304719	16167	71951317	C/T	0.309	0.289	0.537
rs1001507	17620	71952770	G/T	0.908	0.924	0.525
rs1530167	17751	71952901	C/T			
rs1530168	17764	71952914	C/T			
rs1530169	17787	71952937	C/T	0.237	0.202	0.249
rs2304720	19401	71954551	C/T	0.935	0.944	0.661
rs2304721	21021	71956171	A/C	0.759	0.823	0.091
rs893821	21902	71957052	C/T	0.114	0.122	0.778
rs750460	22173	71957323	C/T	0.469	0.440	0.433
rs2304722	22416	71957566	C/T	0.729	0.746	0.572
rs1440102	22653	71957803	A/G			
rs8818	24945	71960095	C/G			
rs3522	25011	71960161	C/T	0.416	0.440	0.454
rs2415206	28563	71963713	C/T	0.362	untyped	NA
rs1984526	48574	71983724	C/G	0.593	untyped	
rs1984525	48710	71983860	C/T			
rs3031653	48880	71984030	-T/TG			
rs2415187	50194	71985344	C/T			
rs2507	56343	71991493	A/G	0.676	0.653	0.471
rs2289411	56455	71991605	C/T			
rs3202077	56729	71991879	C/T			
rs2289412	56759	71991909	A/G	0.964	0.954	0.626
rs2289413	56895	71992045	A/G	0.963	0.959	0.833
rs1061082	57036	71992186	C/G			
rs2277600	57702	71992852	C/G			
rs734854	62515	71997665	C/T	0.403	0.383	0.531
rs2415188	62629	71997779	C/G	0.555	0.564	0.809
rs3214695	63501	71998651	-C	0.289	0.300	0.721
rs3816197	63547	71998697	C/T	0.304	0.308	0.904
rs3816198	64876	72000026	C/G	0.601	0.598	0.922
rs2304715	65073	72000223	C/G	0.649	0.678	0.457
rs2301272	67149	72002299	C/T	0.966	0.959	0.752
rs2301273	67549	72002699	C/T	0.935	0.946	0.649
rs3784563	71660	72006810	A/C	0.502	0.516	0.685
rs3784561	71906	72007056	C/T	0.438	0.471	0.319
rs3784560	71911	72007061	A/C			

TABLE 27

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1048661	213	71935363	G/T	0.307	0.203	0.007
rs3825942	249	71935399	C/T	0.084	0.159	0.031
rs1550436	1824	71936974	C/T	0.406	0.445	0.274
rs1550438	2057	71937207	C/T			
rs1550439	2306	71937456	A/T			
rs2165241	2869	71938019	C/T	0.423	0.439	0.669
rs1550433	3976	71939126	A/C			
rs3056314	4288	71939438	-T/C			
rs2415204	4290	71939440	A/C	0.200	untyped	
rs1992314	4434	71939584	C/G	0.618	0.612	0.854
rs1440101	5298	71940448	A/G			
rs2289414	5467	71940617	A/G			
rs2415205	8486	71943636	C/G			
rs2899807	8487	71943637	A/T	0.965	0.956	0.737
rs893815	8831	71943981	C/G			
rs3056342	9036	71944186	-A/G	0.257	0.264	0.833
rs4077284	9058	71944208	A/G	0.341	0.345	0.905
rs893816	9131	71944281	C/T	0.526	0.509	0.655
rs893817	9732	71944882	A/G	0.142	0.139	0.895
rs893818	9862	71945012	A/G	0.290	0.302	0.712
rs893819	10191	71945341	A/G	0.671	0.642	0.431
rs893820	10270	71945420	C/T	0.934	0.922	0.681
rs2304719	16167	71951317	C/T	0.334	0.316	0.613
rs1001507	17620	71952770	G/T	0.911	0.903	0.741
rs1530167	17751	71952901	C/T			
rs1530168	17764	71952914	C/T			
rs1530169	17787	71952937	C/T	0.173	0.203	0.360
rs2304720	19401	71954551	C/T	0.951	0.952	0.952
rs2304721	21021	71956171	A/C	0.848	0.799	0.150
rs893821	21902	71957052	C/T	0.112	0.106	0.829
rs750460	22173	71957323	C/T	0.478	0.435	0.242
rs2304722	22416	71957566	C/T	0.764	0.748	0.626
rs1440102	22653	71957803	A/G			
rs8818	24945	71960095	C/G			
rs3522	25011	71960161	C/T	0.435	0.444	0.814
rs2415206	28563	71963713	C/T	0.394	0.366	0.419
rs1984526	48574	71983724	C/G			
rs1984525	48710	71983860	C/T			
rs3031653	48880	71984030	-T/TG			
rs2415187	50194	71985344	C/T			
rs2507	56343	71991493	A/G	0.630	0.653	0.509
rs2289411	56455	71991605	C/T			
rs3202077	56729	71991879	C/T			
rs2289412	56759	71991909	A/G	0.979	untyped	
rs2289413	56895	71992045	A/G			
rs1061082	57036	71992186	C/G			
rs2277600	57702	71992852	C/G			
rs734854	62515	71997665	C/T	0.354	0.372	0.611
rs2415188	62629	71997779	C/G	0.502	0.497	0.897
rs3214695	63501	71998651	-C/G	0.331	0.300	0.367
rs3816197	63547	71998697	C/T	0.357	0.317	0.259
rs3816198	64876	72000026	C/G	0.594	0.562	0.416
rs2304715	65073	72000223	C/G	0.674	0.587	0.020
rs2301272	67149	72002299	C/T			

dbSNP rs#	Position in SEQ ID NO: 5	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs2301273	67549	72002699	C/T	0.973	untyped	
rs3784563	71660	72006810	A/C	0.485	0.496	0.777
rs3784561	71906	72007056	C/T	0.511	0.459	0.174
rs3784560	71911	72007061	A/C			

[0254] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1E for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1E can be determined by consulting Table 25. For example, the left-most X on the left graph is at position 71935363. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0255] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter 8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black line provides a local test for excess statistical significance to identify regions of association. This was created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0256] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is placed at the 3' end of each gene to show the direction of transcription.

Example 7

CASPR4 Region Proximal SNPs

[0257] It has been discovered that rs1395486 in the cell recognition protein CASPR4 gene is associated with occurrence of osteoarthritis in subjects. This gene product belongs to the neurexin family, members of which function in the nervous system as cell adhesion molecules and receptors. Like other neurexin proteins, CASPR4 contains epidermal growth factor repeats and laminin G domains. In addition, it includes an F5/8 type C domain, discoidin/neuropilin- and fibrinogen-like domains, and thrombospondin N-terminal-like domains. Alternative splicing of this gene results in 2 transcript variants encoding different isoforms. CASPR4 biological activity can be modulated by addition of an antibody, a recombinant binding partner, a binding agent, or a recombinant CASPR4 protein or functional fragment thereof.

[0258] Fifty-six additional allelic variants proximal to rs1395486 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 28. The chromosome positions provided in column four of Table 28 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 28

dbSNP rs#	Chromosome	Position in SEQ ID NO: 6	Chromosome Position	Allele Variants
rs1896753	16	205	76177855	C/T
rs3974451	16	866	76178516	C/T
rs1820770	16	4212	76181862	C/T
rs1428753	16	5934	76183584	C/T
rs722229	16	11486	76189136	C/T
rs3851754	16	16969	76194619	A/G
rs2340430	16	22509	76200159	A/G
rs2340431	16	22796	76200446	A/G
rs1159415	16	28097	76205747	C/T
rs1506836	16	28626	76206276	C/T
rs1506837	16	28853	76206503	C/T
rs1506838	16	28873	76206523	C/T
rs966668	16	30155	76207805	A/G
rs1911245	16	30827	76208477	C/T
rs1506839	16	31956	76209606	C/T
rs1506840	16	32404	76210054	C/T
rs1876275	16	32944	76210594	A/G
rs1911242	16	35205	76212855	A/G
rs1911243	16	35227	76212877	C/T
rs981231	16	35781	76213431	C/T
rs1506829	16	41052	76218702	C/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 6	Chromosome Position	Allele Variants
rs1506833	16	45051	76222701	A/G
rs1395486	16	46039	76223689	C/T
rs1506832	16	47276	76224926	A/G
rs1506830	16	47678	76225328	C/T
rs968537	16	47716	76225366	A/G
rs1506816	16	51014	76228664	A/G
rs1506828	16	54408	76232058	A/G
rs1506827	16	54596	76232246	C/T
rs1542969	16	56853	76234503	C/G
rs1395484	16	61851	76239501	A/G
rs1876274	16	62016	76239666	A/G
rs1876273	16	62461	76240111	C/T
rs1506822	16	68257	76245907	C/G
rs1506820	16	69793	76247443	C/T
rs1506819	16	73976	76251626	A/C
rs1506818	16	73999	76251649	A/T
rs1506817	16	74053	76251703	A/G
rs1395488	16	75315	76252965	A/G
rs2221534	16	75729	76253379	G/T
rs1911244	16	76466	76254116	A/G
rs2135624	16	77216	76254866	C/T
rs2135623	16	77217	76254867	G/T
rs1506835	16	79239	76256889	C/G
rs1506834	16	80825	76258475	A/G
rs1995653	16	81060	76258710	C/G
rs1995652	16	81097	76258747	A/C
rs1395487	16	81426	76259076	G/T
rs3947083	16	84787	76262437	C/T
rs1506825	16	84896	76262546	A/T
rs1506824	16	85165	76262815	C/G
rs1567118	16	86502	76264152	C/G
rs1039683	16	86753	76264403	C/T
rs2879777	16	86941	76264591	C/T
rs1876272	16	88787	76266437	C/T
rs3035878	16	95598	76273248	-JAGAGC

Assay for Verifying and Allelotyping SNPs

[0259] The methods used to verify and allelotype the 56 proximal SNPs of Table 28 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 29 and Table 30, respectively.

TABLE 29

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1896753	ACGTTGGATGTTTGAAGAGAGGGACTAGAG	ACGTTGGATGGAAAATGAACGTGGAATGGGG
rs3974451	ACGTTGGATGTTGCATAAGGTGTGAGGAAG	ACGTTGGATGAATGGTGTGGGAAAACTGG
rs1820770	ACGTTGGATGCTTGGAAACCAACCCAAATGC	ACGTTGGATGGGCTGCATAGTATTCACAG
rs1428753	ACGTTGGATGCAATAGCTATCTCCTACTTG	ACGTTGGATGGATGCTTTGTATTGCAACCC
rs722229	ACGTTGGATGGAAGGAGGCTCACTATTTCC	ACGTTGGATGGGCTAGGGTAGCAACATCA
rs3851754	ACGTTGGATGAGGTTTGGGAGAAATGCCAACT	ACGTTGGATGAGATTGAATCAGATGGAAGT
rs2340430	ACGTTGGATGATGGCCTTCCAAAGATGTTT	ACGTTGGATGCATCTACAATCCCAATATGCC
rs2340431	ACGTTGGATGTTGTGCAACCTCTGCAAGC	ACGTTGGATGAGATGTCAGCAGGATGCATG
rs1159415	ACGTTGGATGGCTTTCCAATGATTTGGGAG	ACGTTGGATGCTGGGCTCTCCATATGTGTT
rs1506836	ACGTTGGATGCCTGGGACACAGATTCATTTC	ACGTTGGATGCTGCAGCGACCTTTTCATTCA
rs1506837	ACGTTGGATGCTGACATTGAGCTAGCTCTTTC	ACGTTGGATGGTATGTTGGTGAATTTGGTGG
rs1506838	ACGTTGGATGGTATGTTGGTGAATTTGGTGG	ACGTTGGATGGACATTGAGCTAGCTCTTTC
rs966668	ACGTTGGATGCACCTCATAGTGTGAAAAGTC	ACGTTGGATGCCAGTAAATGCAAGATTTTCC
rs1911245	ACGTTGGATGAACCAACTAGGCCAATCGGTG	ACGTTGGATGCCATCAGAAGTAAACCGTTTC
rs1506839	ACGTTGGATGCCAAATTTTCTTTGTTAGAC	ACGTTGGATGTGCACAATTTCAAGTGAAGTC
rs1506840	ACGTTGGATGGGAAGAATGACCTTGTGTGG	ACGTTGGATGGCAGTGTGAGTGAGAGATGATG
rs1876275	ACGTTGGATGAAGTGTCTCTGCCCTTTTG	ACGTTGGATGTTACCGGACATAAGGGAAGG
rs1911242	ACGTTGGATGGTTCCTTAAGTACTTTAGAA	ACGTTGGATGCTCTGCAAGCAATAAGCTAC
rs1911243	ACGTTGGATGCTTATAATTACAGTTCCTAAG	ACGTTGGATGGCAATAAGCTACCAAAATAG
rs981231	ACGTTGGATGATGCTAACCTGTCTAAATCC	ACGTTGGATGTAGTGCTCTGGAGCTAGAAAG
rs1506829	ACGTTGGATGTGGAAGTTGCAATTCCTGT	ACGTTGGATGCCATCTTAAACCAATGCGAG
rs1506833	ACGTTGGATGGTTTTATCTGTTCCCTACAG	ACGTTGGATGGCTGTATACGTACTTTAAAC
rs1395486	ACGTTGGATGCTCATTTATTTTCATGTTTCC	ACGTTGGATGTGCTGGAATAATGATTGTTG
rs1506832	ACGTTGGATGGGTAATGGTCTAAGAATGCC	ACGTTGGATGGAGCTCAATTAGCACTCTCT
rs1506830	ACGTTGGATGCAACAGTAAAGGCATGAAGG	ACGTTGGATGCATTGGACATCAAAAAGTG
rs968537	ACGTTGGATGATTTATTTGGTGGGAAGAGGG	ACGTTGGATGGAATGTACCTAGGCCAAAC
rs1506816	ACGTTGGATGTACATATGACCACTGTTTCC	ACGTTGGATGCAATAGCAGGGAAGTAGTAAG
rs1506828	ACGTTGGATGGAGCTTTTTCATTAGACCC	ACGTTGGATGGTGAATAACAGACAAGGGC
rs1506827	ACGTTGGATGAATGCGCTATATCTGATGAC	ACGTTGGATGAACCAATTTCTTAGCCAGAG
rs1542969	ACGTTGGATGCAGATTACAGCCAAAGTTTC	ACGTTGGATGGGTTTGAATTTCCCAAGACAG
rs1395484	ACGTTGGATGCAAGCTCACATAACACAGGCC	ACGTTGGATGAAGAGATGCCCCGATTTTGG
rs1876274	ACGTTGGATGGGTATCTGTATCATCTGCGTG	ACGTTGGATGGAGGATGATTGACAAGGAG
rs1876273	ACGTTGGATGTGGAAGAAACATAGCTCCTG	ACGTTGGATGAAAATCCCTCCAGTGTGTTGC
rs1506822	ACGTTGGATGTTCTCCAGATCTGCAAAACAG	ACGTTGGATGGTAAATGAGAGAAATAGAGGC
rs1506820	ACGTTGGATGTTCTATATATGTGTGTGTC	ACGTTGGATGTTAGGGTCTCTAGAAAGAG
rs1506819	ACGTTGGATGTGAGGGAATTTGTCTGTCAG	ACGTTGGATGGCCAGAGAGGCTAGAAATTG
rs1506818	ACGTTGGATGAGGGCTGCTTAGCAATTTTCC	ACGTTGGATGAGATCAGAGAGCAATGGTCC
rs1506817	ACGTTGGATGCCCTCTTTCTCGCTTTTCTC	ACGTTGGATGCTCAGATCTCTTGGCAATTTC
rs1395488	ACGTTGGATGGACACTTGAATGCATCACC	ACGTTGGATGGGTGACTTCTGTGACATTGTC
rs2221534	ACGTTGGATGTAATGCAGGCTCAAGTGCC	ACGTTGGATGCAAACTCAGACTGAGTCGCTG
rs1911244	ACGTTGGATGACCTGTAATTCCTGTGTTCCAGG	ACGTTGGATGCAACAACTTCTACTCTCTGGGC
rs2135624	ACGTTGGATGGTACGCCCTACTCTCATATC	ACGTTGGATGAGCTCTTAATTTCCATGGCAG
rs2135623	ACGTTGGATGGTACGCCCTACTCTCATATC	ACGTTGGATGAGCTCTTAATTTCCATGGCAG
rs1506835	ACGTTGGATGAATTAGCTGGACATGGTGGC	ACGTTGGATGTCAAGTGAACCTCCAAACCTC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1506834	ACGTTGGATGACATTTTCCCAGCACTGTCC	ACGTTGGATGCTCACTCCTACTCTGAGTAC
rs1995653	ACGTTGGATGCCAGCCTTCTGTACTCTTG	ACGTTGGATGCTGTCTCATGTTGTTTCCA
rs1995652	ACGTTGGATGCGTGTACAACTGTAATGC	ACGTTGGATGACATAAATATGGCCCTGTC
rs1395487	ACGTTGGATGAAAAGCTTTAGTGCCACAG	ACGTTGGATGGCTTGTGTACTTTAGCTAC
rs3947083	ACGTTGGATGAAGGTGGGCTCTTTATAGTG	ACGTTGGATGGAGGTGTGATGGTTATGTTTC
rs1506825	ACGTTGGATGCGTCATATGATGTTCTGTG	ACGTTGGATGTAGCAGCTTTCGGTGTATAG
rs1506824	ACGTTGGATGAGCAATGGATTCAAATGCTC	ACGTTGGATGCACTGGTCGATGAAAAATAC
rs1567118	ACGTTGGATGTCGGCCAATCTGTCCAAATG	ACGTTGGATGAATGTCCCGTTTCCACAG
rs1039683	ACGTTGGATGTGATGTGTGGAGGCATGTTG	ACGTTGGATGACAGGCAACAACCTGCCAAAG
rs2879777	ACGTTGGATGCTAATCATGTGCGATGAGGG	ACGTTGGATGAAGAAGAGATGGGCCATAGT
rs1876272	ACGTTGGATGTTCTTTGTCTGGAGTGGGAG	ACGTTGGATGGGTCCCAACTAGCAGTTC
rs3035878	ACGTTGGATGTTCTACAAGGAGCTGTGTAG	ACGTTGGATGCTGACTGGTAAATTACGAC

TABLE 30

dbSNP rs#	Extend Primer	Term Mix
rs1896753	GGAATTTAATTTGGTGCCCTCTCA	ACT
rs3974451	TTCAGTTTCAGCTTTCTGCATA	ACG
rs1820770	GAACCAACCCAAATGCCCATCA	ACT
rs1428753	TAACATTTACTGATAGAATAAAGC	ACT
rs722229	TTCCCTGCAGAAAATGAGACA	ACT
rs3851754	AACACACACACACACAGAA	ACT
rs2340430	CGTTGGGACCTATAGGTATG	ACT
rs2340431	CTCTGCAAGCTGGAAGGAC	ACT
rs1159415	TATGTTTAGGAACATTTTCTAAC	ACT
rs1506836	GTCTCACAGCTTGAAGATGC	ACG
rs1506837	CATTGAGCTAGTCTTCTCTGT	ACG
rs1506838	GTTGGTGAATTTGGTGAGAAATCT	ACT
rs966668	TCATAGTGTGAAAAGTCTAAATAA	ACT
rs1911245	TTCTCTTTTTCAGACAAAATTG	ACG
rs1506839	AATTTTGCTTTGTTAGACCTTAGG	ACG
rs1506840	GCTGGTGTCTGTGAAATTG	ACG
rs1876275	TCTTGGTTCAGGTATCACCTA	ACG
rs1911242	TAGAAAAATTGCTTTTGGAGAAA	ACG
rs1911243	TAATTCAGTCCCTAAGTACTTTA	ACT
rs981231	CCTGTCTAAATCCATTGATTAAA	ACT
rs1506829	GATCTAAATAGCTACTGGGAAA	ACT
rs1506833	TCTGGTTCCTACAGAAACACTTA	ACG
rs1395486	TTTCATGTTTACAAAAAATCTCT	ACG
rs1506832	GGTCATAAGAATGCCATTATTCT	ACG
rs1506830	AATAATATGTTTGGCCTACGTAA	ACG
rs968537	AGGGAGGTAAGAGTCAACAGTAA	ACT

dbSNP rs#	Extend Primer	Term Mix
rs1506816	ATATGACCACTGTTTCCTCATTT	ACT
rs1506828	CCATTAGACCCCTTAGCATAT	ACG
rs1506827	TGACAATAAGAACTAAGACAAATA	ACT
rs1542969	GCCAAAGTTTGCATCTTTTCATGT	ACT
rs1395484	AACACAGGCACAGCTGTGAT	ACT
rs1876274	CTAATTCACAAATATTCCTTACT	ACT
rs1876273	TAGCTCCTGGCCCTACCAT	ACT
rs1506822	CTGCAACAGGATCACTGCT	ACT
rs1506820	ATATACAGAACACACACACACA	ACG
rs1506819	TCTGCAGGAGCACGGACC	CGT
rs1506818	GGCCAAGGATCTGAGGGAA	CGT
rs1506817	TGCTTTCTCAGGGCTGCTT	ACT
rs1395488	TGAATGCATCACCCGAGGAT	ACT
rs2221534	CTCAAGTGCCTATCTATCATG	CGT
rs1911244	TTCCAGGTTAGAATTCAGAGAT	ACG
rs2135624	CTCTCATATCAATTCTCCCTGTT	ACG
rs2135623	CTCTCATATCAATTCTCCCTGT	ACT
rs1506835	GACATGGTGGCAAATTCCTGTA	ACT
rs1506834	ACTGTCCCATTCACTGTCAATA	ACT
rs1995653	TTCTGTTACTCTTGATCAGAATGC	ACT
rs1995652	TAATGCTTTTATGAACCTAGTTGT	ACT
rs1395487	CTTTAGGTGCCACAGAAGATA	CGT
rs3947083	GGGCTCTTTATAGTGATTTTCCT	ACG
rs1506825	ATACTGTGAGAAAGATGAAGGT	CGT
rs1506824	CAAAATGCTCAAATATCAATATGTG	ACT
rs1567118	TGTCCAAATGGCAATGTTGGT	ACT
rs1039683	GGAGGCATGTTGGAACCTACAGAC	ACT
rs2879777	GAGGGGTGGTCACACAGC	ACT
rs1876272	CTGGAGTGGGAGACAGGGT	ACG
rs3035878	TGTGTAGCTAAATGTTGAGCAGAG	ACT

Genetic Analysis

[0260] Allelotyping results from the discovery cohort are shown for cases and controls in Table 31. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 (A1 AF = 1-A2 AF). For example, the SNP rs1896753 has the following case and control allele frequencies: case A1 (A) = 0.79; case A2 (T) = 0.21; control A1 (A) = 0.81; and control A2 (T) = 0.19, where the nucleotide is provided in paranthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 31

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1896753	205	76177855	C/T			
rs3974451	866	76178516	C/T			
rs1820770	4212	76181862	C/T			
rs1428753	5934	76183584	C/T	0.486	0.467	0.459
rs722229	11486	76189136	C/T			
rs3851754	16969	76194619	A/G	0.287	0.300	0.569
rs2340430	22509	76200159	A/G	0.488	0.523	0.155
rs2340431	22796	76200446	A/G	0.030	0.028	0.844
rs1159415	28097	76205747	C/T	0.480	0.477	0.919
rs1506836	28626	76206276	C/T	0.401	0.404	0.891
rs1506837	28853	76206503	C/T	0.394	0.396	0.933
rs1506838	28873	76206523	C/T	0.334	0.343	0.727
rs966668	30155	76207805	A/G			
rs1911245	30827	76208477	C/T	0.836	0.824	0.631
rs1506839	31956	76209606	C/T	0.434	0.436	0.936
rs1506840	32404	76210054	C/T	0.382	0.381	0.993
rs1876275	32944	76210594	A/G	0.463	0.461	0.918
rs1911242	35205	76212855	A/G	0.419	0.410	0.703
rs1911243	35227	76212877	C/T			
rs981231	35781	76213431	C/T	0.451	0.430	0.510
rs1506829	41052	76218702	C/T	0.393	0.379	0.576
rs1506833	45051	76222701	A/G	0.509	0.530	0.378
rs7395486	46039	76223689	C/T			
rs1506832	47276	76224926	A/G	0.518	0.516	0.949
rs1506830	47678	76225328	C/T	0.036	0.031	0.710
rs968537	47716	76225366	A/G	0.243	0.275	0.175
rs1506816	51014	76228664	A/G	0.392	0.369	0.348
rs1506828	54408	76232058	A/G	0.418	0.413	0.816
rs1506827	54596	76232246	C/T	0.432	0.449	0.477
rs1542969	56853	76234503	C/G			
rs1395484	61851	76239501	A/G	0.417	0.441	0.349
rs1876274	62016	76239666	A/G	0.381	0.369	0.629
rs1876273	62461	76240111	C/T	0.382	0.364	0.445
rs1506822	68257	76245907	C/G	0.355	0.351	0.855
rs1506820	69793	76247443	C/T	0.326	0.256	0.054
rs1506819	73976	76251626	A/C	0.446	0.424	0.358
rs1506818	73999	76251649	A/T	0.126	0.145	0.465
rs1506817	74053	76251703	A/G	0.186	0.199	0.570
rs1395488	75315	76252965	A/G	0.489	0.499	0.689
rs2221534	75729	76253379	G/T	0.450	0.431	0.455
rs1911244	76466	76254116	A/G	0.493	0.491	0.960
rs2135624	77216	76254866	C/T			
rs2135623	77217	76254867	G/T	0.034	0.032	0.899
rs1506835	79239	76256889	C/G	0.549	0.538	0.666
rs1506834	80825	76258475	A/G	0.390	0.392	0.958
rs1995653	81060	76258710	C/G	0.396	0.402	0.783
rs1995652	81097	76258747	A/C	0.436	0.435	0.979
rs1395487	81426	76259076	G/T	0.505	0.504	0.975
rs3947083	84787	76262437	C/T	0.373	0.366	0.773
rs1506825	84896	76262546	A/T	0.412	0.398	0.569
rs1506824	85165	76262815	C/G	0.444	0.414	0.242
rs1567118	86502	76264152	C/G	0.032	0.024	0.557
rs1039683	86753	76264403	C/T	0.382	0.373	0.707
rs2879777	86941	76264591	C/T	0.269	0.279	0.676

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1876272	88787	76266437	C/T			
rs3035878	95598	76273248	-/AGAGC	0.978	untyped	NA

[0261] The *CASPR4* proximal SNPs were also allelotyped in the replication cohorts using the methods described herein and the primers provided in Tables 29 and 30. The replication allelotyping results for replication cohort #1 and replication cohort #2 are provided in Tables 32 and 33, respectively.

TABLE 32

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1896753	205	76177855	C/T			
rs3974451	866	76178516	C/T			
rs1820770	4212	76181862	C/T			
rs1428753	5934	76183584	C/T	0.463	0.474	0.756
rs722229	11486	76189136	C/T			
rs3851754	16969	76194619	A/G	0.283	0.309	0.375
rs2340430	22509	76200159	A/G	0.494	0.519	0.477
rs2340431	22796	76200446	A/G	0.035	0.028	0.748
rs1159415	28097	76205747	C/T	0.436	0.472	0.287
rs1506836	28626	76206276	C/T	0.392	0.401	0.786
rs1506837	28853	76206503	C/T	0.388	0.399	0.727
rs1506838	28873	76206523	C/T	0.318	0.327	0.778
rs966668	30155	76207805	A/G			
rs1911245	30827	76208477	C/T	0.825	0.821	0.896
rs1506839	31956	76209606	C/T	0.450	0.441	0.817
rs1506840	32404	76210054	C/T	0.379	0.383	0.926
rs1876275	32944	76210594	A/G	0.469	0.470	0.986
rs1911242	35205	76212855	A/G	0.437	0.415	0.514
rs1911243	35227	76212877	C/T			
rs981231	35781	76213431	C/T	0.449	0.414	0.415
rs1506829	41052	76218702	C/T	0.398	0.394	0.894
rs1506833	45051	76222701	A/G	0.515	0.544	0.393
rs1395486	46039	76223689	C/T			
rs1506832	47276	76224926	A/G	0.526	0.511	0.720
rs1506830	47678	76225328	C/T	0.053	0.039	0.488
rs968537	47716	76225366	A/G	0.241	0.298	0.045
rs1506816	51014	76228664	A/G	0.379	0.370	0.771
rs1506828	54408	76232058	A/G	0.416	0.429	0.706
rs1506827	54596	76232246	C/T	0.428	0.435	0.836
rs1542969	56853	76234503	C/G			
rs1395484	61851	76239501	A/G	0.418	0.459	0.208
rs1876274	62016	76239666	A/G	0.384	0.382	0.942
rs1876273	62461	76240111	C/T	0.393	0.360	0.271
rs1506822	68257	76245907	C/G	0.353	0.368	0.637
rs1506820	69793	76247443	C/T	0.288	untyped	NA
rs1506819	73976	76251626	A/C	0.453	0.424	0.378
rs1506818	73999	76251649	A/T	0.149	NA	0.126
rs1506817	74053	76251703	A/G	0.195	0.212	0.573
rs1395488	75315	76252965	A/G	0.490	0.490	1.000

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs2221534	75729	76253379	G/T	0.446	0.433	0.711
rs1911244	76466	76254116	A/G	0.495	0.480	0.646
rs2135624	77216	76254866	C/T			
rs2135623	77217	76254867	G/T	0.027	0.030	0.896
rs1506835	79239	76256889	C/G	0.563	0.556	0.848
rs1506834	80825	76258475	A/G	0.377	0.388	0.722
rs1995653	81060	76258710	C/G	0.381	0.395	0.675
rs1995652	81097	76258747	A/C	0.435	0.423	0.750
rs1395487	81426	76259076	G/T	0.505	0.500	0.874
rs3947083	84787	76262437	C/T	0.367	0.370	0.929
rs1506825	84896	76262546	A/T	0.406	0.397	0.798
rs1506824	85165	76262815	C/G	0.446	0.413	0.361
rs1567118	86502	76264152	C/G	0.029	0.023	0.776
rs1039683	86753	76264403	C/T	0.376	0.365	0.729
rs2879777	86941	76264591	C/T	0.265	0.278	0.669
rs1876272	88787	76266437	C/T			
rs3035878	95598	76273248	-/AGAGC	0.972	untyped	NA

TABLE 33

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1996753	205	76177855	C/T			
rs3974451	866	76178516	C/T			
rs1820770	4212	76181862	C/T			
rs1428753	5934	76183584	C/T	0.515	0.457	0.124
rs722229	11486	76189136	C/T			
rs3851754	16969	76194619	A/G	0.292	0.286	0.868
rs2340430	22509	76200159	A/G	0.480	0.531	0.169
rs2340431	22796	76200446	A/G	0.024	0.027	0.900
rs1159415	28097	76205747	C/T	0.535	0.485	0.252
rs1506836	28626	76206276	C/T	0.412	0.410	0.947
rs1506837	28853	76206503	C/T	0.402	0.391	0.768
rs1506838	28873	76206523	C/T	0.355	0.368	0.734
rs966668	30155	76207805	A/G			
rs1911245	30827	76208477	C/T	0.849	0.828	0.569
rs1506839	31956	76209606	C/T	0.414	0.428	0.746
rs1506840	32404	76210054	C/T	0.384	0.379	0.905
rs1876275	32944	76210594	A/G	0.456	0.447	0.805
rs1911242	35205	76212855	A/G	0.397	0.402	0.892
rs1911243	35227	76212877	C/T			
rs981231	35781	76213431	C/T	0.454	0.455	0.971
rs1506829	41052	76218702	C/T	0.386	0.356	0.424
rs1506833	45051	76222701	A/G	0.500	0.509	0.811
rs1395486	46039	76223689	C/T			
rs1506832	47276	76224926	A/G	0.508	0.524	0.689
rs1506830	47678	76225328	C/T			
rs968537	47716	76225366	A/G	0.246	0.237	0.806
rs1506816	51014	76228664	A/G	0.408	0.367	0.284
rs1506828	54408	76232058	A/G	0.421	0.387	0.358
rs1506827	54596	76232246	C/T	0.436	0.471	0.346
rs1542969	56853	76234503	C/G			
rs1395484	61851	76239501	A/G	0.416	0.413	0.938

dbSNP rs#	Position in SEQ ID NO: 6	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1876274	62016	76239666	A/G	0.376	0.350	0.447
rs1876273	62461	76240111	C/T	0.367	0.370	0.924
rs1506822	68257	76245907	C/G	0.358	0.325	0.355
rs1506820	69793	76247443	C/T	0.373	0.256	0.007
rs1506819	73976	76251626	A/C	0.438	0.424	0.703
rs1506818	73999	76251649	A/T	0.139	-0.013	
rs1506817	74053	76251703	A/G	0.174	0.178	0.897
rs1395488	75315	76252965	A/G	0.487	0.512	0.505
rs2221534	75729	76253379	G/T	0.455	0.429	0.463
rs1911244	76466	76254116	A/G	0.489	0.509	0.581
rs2135624	77216	76254866	C/T			
rs2135623	77217	76254867	G/T	0.042	0.035	0.748
rs1506835	79239	76256889	C/G	0.531	0.510	0.562
rs1506834	80825	76258475	A/G	0.407	0.397	0.787
rs1995653	81060	76258710	C/G	0.414	0.413	0.984
rs1995652	81097	76258747	A/C	0.437	0.455	0.629
rs1395487	81426	76259076	G/T	0.506	0.512	0.869
rs3947083	84787	76262437	C/T	0.379	0.359	0.559
rs1506825	84896	76262546	A/T	0.419	0.399	0.579
rs1506824	85165	76262815	C/G	0.442	0.414	0.471
rs1567118	86502	76264152	C/G	0.036	0.025	0.574
rs1039683	86753	76264403	C/T	0.389	0.385	0.910
rs2879777	86941	76264591	C/T	0.275	0.280	0.883
rs1876272	88787	76266437	C/T			
rs3035878	95598	76273248	-/AGAGC	untyped	0.980	NA

[0262] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1F for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1F can be determined by consulting Table 31. For example, the left-most X on the left graph is at position 76177855. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0263] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter 8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black

line provides a local test for excess statistical significance to identify regions of association. This was created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0264] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is placed at the 3' end of each gene to show the direction of transcription.

Example 8

APOB Proximal SNPs

[0265] It has been discovered that rs1367117 is associated with occurrence of osteoarthritis in subjects. The polymorphic variant lies within the *APOB* gene and codes for a I98T amino acid change. The guanine allele of SNP rs1367117 is associated with osteoarthritis (see Table 5) and codes for a threonine at position 98 (see e.g. amino acid sequence in SEQ ID NO: 19).

[0266] Apolipoprotein B (ApoB) is the main apolipoprotein of chylomicrons and low density lipoproteins (LDL). Apo B binds to sulfated proteoglycans, especially chondroitin and dermatan sulfate, that are components of cartilage (Camejo et. al., *Atherosclerosis*. 1998 Aug;139(2):205-22). This may contribute to inflammation/joint damage by lipoprotein oxidation products. In addition, increased levels of ApoB is seen as a risk factor for osteonecrosis (Miyanishi et. al., *Ann Rheum Dis*. 1999 Aug;58(8):514-6). Lipoprotein deposition has been noted in inflammatory (rheumatoid) arthritis and may play a role in inflammation mediated osteoarthritis. ApoB function can be modulated by addition of an antibody or a decoy receptor for ApoB. Examples of antibodies and small molecules that specifically interact with ApoB are described in U.S. Patent Nos. 6,107,045; 6,309,844; 5,330,910; and 6,369,075.

[0267] One hundred twenty-two additional allelic variants proximal to rs1367117 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 34. The chromosome positions provided in column four of Table 34 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 34

dbSNP rs#	Chromosome	Position in SEQ ID NO: 1	Chromosome Position	Allele Variants
rs1318006	2	238	21188688	C/T
rs1318005	2	294	21188744	C/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 1	Chromosome Position	Allele Variants
rs1318004	2	295	21188745	A/G
rs1318003	2	347	21188797	A/C
rs4327259	2	1425	21189875	A/C
rs6756501	2	4891	21193341	C/T
rs6725189	2	5087	21193537	G/T
rs4665709	2	7041	21195491	A/G
rs4665710	2	7121	21195571	A/C
rs4371387	2	7219	21195669	A/G
rs952274	2	7443	21195893	G/T
rs952275	2	7485	21195935	G/T
rs1801695	2	10939	21199389	A/G
rs1042034	2	11367	21199817	A/G
rs1801702	2	11571	21200021	C/G
rs1042031	2	11839	21200289	A/G
rs2678378	2	12551	21201001	A/G
rs2678379	2	12646	21201096	A/G
rs1800479	2	13469	21201919	G/C
rs1801701	2	14913	21203363	A/G
rs4362589	2	15205	21203655	G/T
rs5742904	2	15246	21203696	A/G
rs1799812	2	15695	21204145	G/A
rs2163204	2	17473	21205923	G/T
rs676210	2	17610	21206060	A/G
rs1042006	2	17828	21206278	A/C
rs1801696	2	18130	21206580	A/G
rs693	2	18281	21206731	C/T
rs1041974	2	18623	21207073	C/G
rs1041968	2	18890	21207340	C/T
rs568413	2	21561	21210011	C/T
rs2854726	2	23100	21211550	A/T
rs2854725	2	23872	21212322	A/C
rs2000998	2	24581	21213031	A/T
rs2000997	2	24582	21213032	A/T
rs497166	2	24983	21213433	C/T
rs562956	2	27540	21215990	A/T
rs7589300	2	30846	21219296	C/T
rs3791980	2	31415	21219865	G/T
rs3791981	2	31453	21219903	A/G
rs1801700	2	31899	21220349	T/C
rs679899	2	37000	21225450	A/G
rs1041952	2	38681	21227131	C/G
rs6727706	2	39287	21227737	C/T
rs6719207	2	42951	21231401	A/T
rs1469513	2	45648	21234098	C/T
rs1800478	2	46222	21234672	C/T
rs550619	2	46687	21235137	A/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 1	Chromosome Position	Allele Variants
rs6752026	2	47020	21235470	A/G
rs579826	2	47593	21236043	C/T
rs597331	2	48513	21236963	C/T
rs1367116	2	49723	21238173	A/G
rs1367117	2	49986	21238436	A/G
rs1800480	2	53018	21241468	C/G
rs1800481	2	53296	21241746	C/T
rs934197	2	53547	21241997	A/G
rs1625764	2	53899	21242349	C/T
rs1625714	2	53916	21242366	G/T
rs1560357	2	53933	21242383	A/C
rs617314	2	54305	21242755	G/T
rs547186	2	55327	21243777	A/T
rs589566	2	55895	21244345	C/T
rs588245	2	56143	21244593	C/T
rs585967	2	56640	21245090	G/T
rs7562777	2	58486	21246936	A/G
rs7575840	2	59576	21248026	G/T
rs7567653	2	63048	21251498	A/G
rs6548010	2	64008	21252458	A/G
rs6548011	2	64018	21252468	C/T
rs934198	2	64859	21253309	A/C
rs634292	2	65995	21254445	G/T
rs1003177	2	66905	21255355	A/G
rs6726115	2	67183	21255633	A/G
rs481069	2	67942	21256392	C/T
rs1367115	2	68101	21256551	A/G
rs666126	2	68521	21256971	A/G
rs7566030	2	68664	21257114	C/G
rs7590135	2	68988	21257438	A/G
rs6718513	2	69178	21257628	C/G
rs515135	2	72143	21260593	A/G
rs1367114	2	74183	21262633	C/G
rs563290	2	74312	21262762	C/T
rs562338	2	74407	21262857	C/T
rs581411	2	75518	21263968	A/G
rs580889	2	76153	21264603	A/G
rs548145	2	77398	21265848	A/G
rs668948	2	77615	21266065	A/G
rs594677	2	79092	21267542	C/T
rs571468	2	80000	21268450	G/T
rs4665492	2	80125	21268575	A/C
rs622236	2	80595	21269045	G/T
rs541041	2	81061	21269511	C/T
rs540156	2	81151	21269601	A/G
rs1367113	2	81918	21270368	C/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 1	Chromosome Position	Allele Variants
rs1897084	2	83072	21271522	C/T
rs1897083	2	83137	21271587	C/T
rs478588	2	83235	21271685	C/T
rs664894	2	83263	21271713	A/T
rs1594286	2	83279	21271729	A/G
rs7422168	2	83280	21271730	C/G
rs565202	2	83533	21271983	C/T
rs1429974	2	86856	21275306	G/T
rs5829769	2	87186	21275636	-/TATA
rs3056575	2	87189	21275639	-/ATAT
rs6708168	2	87727	21276177	A/T
rs6756743	2	87978	21276428	C/T
rs2195598	2	89129	21277579	A/G
rs7567217	2	89556	21278006	C/T
rs568938	2	89702	21278152	A/G
rs666416	2	90233	21278683	A/G
rs6761300	2	93060	21281510	A/G
rs5829770	2	94779	21283229	-/T
rs1429973	2	95367	21283817	A/G
rs1429972	2	95844	21284294	A/G
rs6756284	2	95942	21284392	A/G
rs749988	2	96884	21285334	C/T
rs749987	2	96938	21285388	A/G
rs754524	2	97627	21286077	A/C
rs754523	2	97777	21286227	C/T
rs675430	2	97871	21286321	A/C
rs600012	2	98746	21287196	A/G
rs614303	2	99663	21288113	A/G

Assay for Verifying and Allelotyping SNPs

[0268] The methods used to verify and allelotype the 122 proximal SNPs of Table 34 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 35 and Table 36, respectively.

TABLE 35

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1318006	ACGTTGGATGTCCTCATGGCCCATCCAAGGC	ACGTTGGATGAAGGAGCCCATGAAGGCAGC
rs1318005	ACGTTGGATGACAGCCCTTGGATGGGCCATG	ACGTTGGATGTCCTCCAGTCTGGTGGAAAG
rs1318004	ACGTTGGATGACAGCCCTTGGATGGGCCATG	ACGTTGGATGTCCTCCAGTCTGGTGGAAAG
rs1318003	ACGTTGGATGTTTCCACCAGACTGGGAGAC	ACGTTGGATGAGTGCCCGAGCAGACAGTCTT
rs4327259	ACGTTGGATGAACAAGCTTGCTCAGCCACT	ACGTTGGATGTGTCTCTGTCAGGAAGAG
rs6756501	ACGTTGGATGATGCATTTCGCTGTTTG	ACGTTGGATGGAGATCAATGAGAAAAATAGG

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs6725189	ACGTTGGATGAAGAACAATAGAGAGGGCCG	ACGTTGGATGAGTATTGACTGCCCTTGGTTC
rs4665709	ACGTTGGATGGCACAACCTCATAGATGTGG	ACGTTGGATGCCAACCCTCATCACTTGTGGAT
rs4665710	ACGTTGGATGAATCCACAATGATGGAGGTG	ACGTTGGATGGATAACCTCACTCACTACACG
rs4371387	ACGTTGGATGTAAAGGTGTGATGACCTCC	ACGTTGGATGTGCATGGCAGAAAGTTAAAGGG
rs952274	ACGTTGGATGCAGAAGGGTGACATGTCATTG	ACGTTGGATGCTCATATCCAGATTACACCC
rs952275	ACGTTGGATGCACAATGTCATGTCACCCCTTC	ACGTTGGATGGACACTCTCTTGTGCGAAG
rs1801695	ACGTTGGATGGAAATTAATTTCTTCTGTCG	ACGTTGGATGTGCTCAGGAAATTAATTA
rs1042034	ACGTTGGATGATCCAAGATGAGATCAACAC	ACGTTGGATGGGCTATAGGTTTTCTTTCAAC
rs1801702	ACGTTGGATGTTTTGATAAATCTTTCAAC	ACGTTGGATGCTCAATAGATGTAATCTCGA
rs1042031	ACGTTGGATGGTTTGATGGCTTGGTACGAG	ACGTTGGATGTTTCCCGGAAACTGGAATC
rs2678378	ACGTTGGATGGTTTTCACTCTAGGAAGCG	ACGTTGGATGTATACATGCCCCAGAAAGG
rs2678379	ACGTTGGATGCTTCCCTAGGACTGAAACTG	ACGTTGGATGTGGGCTCCAACCTTGCCTTTT
rs1800479	ACGTTGGATGAAGGGTATGGAGATGAAGA	ACGTTGGATGACCTTATACCTTTTGA
rs1801701	ACGTTGGATGCTTGGTCATTTGGAAGCTCG	ACGTTGGATGGTGGCCCTGAATGTCAACAC
rs4362589	ACGTTGGATGCTGACAGGGCACCTCCAAAT	ACGTTGGATGTATATGCGTTGGAGTGTGGC
rs5742904	ACGTTGGATGATTTTGAAGTGCCCTGCAG	ACGTTGGATGCTATTGCTAGTGAGGCCAAC
rs1799812	ACGTTGGATGTTGTGGTGCCCTCTAATTT	ACGTTGGATGCATCTTCATCTGTGATTGA
rs2163204	ACGTTGGATGTTTGGGACTCTCTTTGGCAG	ACGTTGGATGCTGACATGACGGAATGGAAC
rs676210	ACGTTGGATGCCCAACTCTCAACCTTAATG	ACGTTGGATGAATTTGTGTGAGATGTGGG
rs1042006	ACGTTGGATGCAGCATCTGGTCAATGGTTC	ACGTTGGATGACACCTTCCACATCTCTTC
rs1801696	ACGTTGGATGTGCTAAGAACCCTACTGAC	ACGTTGGATGGGCCCAATCTTGGATAGAAT
rs693	ACGTTGGATGCAGCATCTTTGGCTCACATG	ACGTTGGATGTCTCTGCTGAATGTCCATTTG
rs1041974	ACGTTGGATGTACTTTGAGAAATTGGTTGG	ACGTTGGATGGTTTAACATCTTCAATGATG
rs1041968	ACGTTGGATGTCAGCTACTTCAAATCCCC	ACGTTGGATGGGCTATTGATGTTAGAGTGC
rs568413	ACGTTGGATGGAGACTGGGTTGTTTCCAAAG	ACGTTGGATGCCACAAGAATACGTTCAAC
rs2854726	ACGTTGGATGCTCTAGCTTAACAGCAAGCC	ACGTTGGATGGCAAATCTCCCTCTGACTG
rs2854725	ACGTTGGATGCATTCAGCTTTGTGTAAGT	ACGTTGGATGTTTCAAAGACTGTATAAGG
rs2000998	ACGTTGGATGTGAACCATCTTGTATCTGG	ACGTTGGATGTGGCCCAATGATTTTGTCC
rs2000997	ACGTTGGATGTGGCCACCAATGATTTTGTCC	ACGTTGGATGTGAACCATCTTGTATCTGG
rs497166	ACGTTGGATGTCCCAAGTGCTGGGATTAC	ACGTTGGATGAAATCCAACGTGACATGCCG
rs562956	ACGTTGGATGTAAACAGTCTTACCACAGCG	ACGTTGGATGATAAGGGAAAGTCTCCCTGG
rs7589300	ACGTTGGATGTACACAGTATGTGAGTAG	ACGTTGGATGCTACTCTATGATTAAGTGC
rs3791980	ACGTTGGATGTCTGGAGAGATCATCTTTGG	ACGTTGGATGCTACTGACTACCTCAAATC
rs3791981	ACGTTGGATGTGTTTTGAGAATGAAGAAC	ACGTTGGATGTGCTTCTAGGATTTTGTGG
rs1801700	ACGTTGGATGGACCCGACTCGTGGGAAGAA	ACGTTGGATGTGCTAGGAGTGGGTGCA
rs679899	ACGTTGGATGCTGAAATCCATGACAGTTGG	ACGTTGGATGTGTGCTCTCCCATATTGCC
rs1041952	ACGTTGGATGCATGGAGCAGTTAACTCCAG	ACGTTGGATGTCTGGATCACTAGTATGAGC
rs6727706	ACGTTGGATGGCACCCTATTGAAAAGGG	ACGTTGGATGCACATACTTACAGTCAACGG
rs6719207	ACGTTGGATGTGCTCCAGATGTGAACCATGTC	ACGTTGGATGGGAATCCAGACTTGTCTGAG
rs1469513	ACGTTGGATGCTTTTCTGACACAAGGACTCC	ACGTTGGATGACTCCACTCATGCGGATGAG
rs1800478	ACGTTGGATGTGACGGTAAAGTGAGTGGAG	ACGTTGGATGCCCGTGTGAAATCATGTGG
rs550619	ACGTTGGATGGCAACACAGGTGAAGCATC	ACGTTGGATGGGCTTATCAGGTGGGCTCTA
rs6752026	ACGTTGGATGCAGAAAGGGAAGCAGGTTTTTC	ACGTTGGATGCAGAAATGATGCCCCCTTGT
rs579826	ACGTTGGATGAAAGTGCTGGGACTACAGGC	ACGTTGGATGATATGGGTGGAGAACAGAGC
rs597331	ACGTTGGATGACACTCTCTCAGAAAGTTCC	ACGTTGGATGGTATGGTGTGATCAGATCAGAG
rs1377116	ACGTTGGATGCAGAAGTTTAAAGCATGAG	ACGTTGGATGATCATCAATAAAGAGCAAGC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1367117	ACGTTGGATGTTGGTTTCTTCAGCAAGGC	ACGTTGGATGAGCTTCATCCTGAAGACCAG
rs1800480	ACGTTGGATGCCGAGAAGGGCACTCAGCC	ACGTTGGATGCCGCCGCCGCCGCAATCCCA
rs1800481	ACGTTGGATGATCTGAAGAAGGCACCCCTG	ACGTTGGATGAAGCGTCTTCAGTGTCTGG
rs934197	ACGTTGGATGTGACTGGTCACTACCACAG	ACGTTGGATGATCCTGATCAGAATCTGTGG
rs1625764	ACGTTGGATGCAGAGGCATCGAGCGCTGG	ACGTTGGATGGACAGGACACGTCATGTTCC
rs1625714	ACGTTGGATGAATCCACTACCGCTGATC	ACGTTGGATGATCGTTTCTTCTCTCTAG
rs1560357	ACGTTGGATGGTCCCTGAAATTCACATCC	ACGTTGGATGATTTCCACCAGGAAGCTTCA
rs617314	ACGTTGGATGCAGTCTTCCACGATAGCTTG	ACGTTGGATGTGCGAAGTCAGTGTGTGC
rs547186	ACGTTGGATGCAGTTCAGGGAAGACTTGCC	ACGTTGGATGGAGAGGACTGTCCACTCTC
rs589566	ACGTTGGATGCCAGCAGACCAATATTCTG	ACGTTGGATGGGTATAGCTGAATGGTGCAG
rs588245	ACGTTGGATGGCTCCAAATCTCATCTGGC	ACGTTGGATGAGCTTCTGGGCATCAATTGC
rs585967	ACGTTGGATGTGACAGGGAATCAGAGTCAC	ACGTTGGATGCCCACTACTGCACCTAATCT
rs7562777	ACGTTGGATGTTGGAGATTGCTCTTTGGGC	ACGTTGGATGTGACCTCAGGTTATCCACAC
rs7575840	ACGTTGGATGCATAGACTGTCCATCACAGG	ACGTTGGATGGGTGTGAGAAAACTCCAC
rs7567553	ACGTTGGATGAAAGTGGTGATGGATGCCCTG	ACGTTGGATGGGAGCAAAATAGCTCATCTG
rs6548010	ACGTTGGATGGCCTGGATTCCGGTTTTTAA	ACGTTGGATGCTATAAGCTGCTTATCAGAG
rs6548011	ACGTTGGATGCTATAAGCTGCTTATCAGAG	ACGTTGGATGGCCTGGATTCCGGTTTTTAA
rs934198	ACGTTGGATGACATGGGAAGGAGGATGAGTG	ACGTTGGATGAGGTATGAGACCTCATGATG
rs634292	ACGTTGGATGGAGGCTTGTTTATGGCACAG	ACGTTGGATGCGTGTCTTTTCTCAAGTGCC
rs1003177	ACGTTGGATGTACACAGACCCAGAAGATAC	ACGTTGGATGGATGCATGAACAAAGGAAGC
rs6726115	ACGTTGGATGATACAGATAAGGCACCTTGGC	ACGTTGGATGGAGGAAGCACTGAACGTGAAAGG
rs481069	ACGTTGGATGTTTGAACCTTCTGAATGGTG	ACGTTGGATGATTGTGAGGGTTTACTTTCC
rs1367115	ACGTTGGATGGGTTTGAACAACCTGATTGG	ACGTTGGATGGGTAGGGAATACTTTCAACG
rs666126	ACGTTGGATGTTCTGCAGGATTCATCTCTC	ACGTTGGATGTTTTGTATGCCAGGTTAAGG
rs7566030	ACGTTGGATGGATACAGAAGAGAGTGGTGG	ACGTTGGATGAGACTTTCAGCCTTCAATGGC
rs7590135	ACGTTGGATGACTGGTCTTAGGGTTACACC	ACGTTGGATGACAAAGCACTGCTGCACAGA
rs6718513	ACGTTGGATGCTTCCCTAGGCTGAAGAAC	ACGTTGGATGGCTCTTATAGTGCCAAAGAG
rs515135	ACGTTGGATGGGCTTACAGCCAAGTAACAG	ACGTTGGATGACCATTCTGTACTGCACAG
rs1367114	ACGTTGGATGGTTGAGGAATTTATTCGAGG	ACGTTGGATGGTGTGTGTGATTGTGTTTG
rs563290	ACGTTGGATGGGGAATAATGCTCAATGAAC	ACGTTGGATGTCTGGGTATTCATCCAGAAG
rs562338	ACGTTGGATGACCCAAGATGTAGAACAAGC	ACGTTGGATGCCATGGTTTGCATACATCAC
rs581411	ACGTTGGATGACCTGTGTGCTTCACTGTT	ACGTTGGATGGAGCAAGTGAAGAAAGTGGGC
rs580889	ACGTTGGATGTGGGCTGACTCTCTTATCTC	ACGTTGGATGCCCTGCACTGCAATTAAGCC
rs548145	ACGTTGGATGGAAGGAGGATGGTCAGAAAC	ACGTTGGATGAGCTGTATCTCCCTTTGTG
rs668948	ACGTTGGATGATTGGAATAGGAAGGGCATG	ACGTTGGATGCTCTATCGTAATGGGGAAGAG
rs594677	ACGTTGGATGGACTTGGTATTGAACAGGAC	ACGTTGGATGTAGCAGGCATTTGCATTTTG
rs571468	ACGTTGGATGGTGATGAAATTAAGGCCAGG	ACGTTGGATGATCTCACTGTTTCCAGGCG
rs4665492	ACGTTGGATGAGTGCCTCACTCTATTGAC	ACGTTGGATGCCCAACAGCATGTAAAGTCAC
rs622236	ACGTTGGATGCGCTTTTCTGTACTGTTTGG	ACGTTGGATGTCCCTTCTCATCACTAAAGAC
rs541041	ACGTTGGATGAGGAGGAAAGGTCACATTC	ACGTTGGATGATGCAGTAAGAGTAAAGTGGC
rs540156	ACGTTGGATGCTTGTCTTTGAAATCCATAG	ACGTTGGATGCTCTCCTCCATGAATAATTAC
rs1367113	ACGTTGGATGATAAATCTGCAGGAGGACAG	ACGTTGGATGAGAAACAATGTCTCTCTGTG
rs1897084	ACGTTGGATGCTTCACTCTCTTAAAGGTC	ACGTTGGATGCACAAACTATGAACCTTGC
rs1897083	ACGTTGGATGGTTCAACCTATCATTTTCTTC	ACGTTGGATGTAACCTCAATATGGAATTAGC
rs478588	ACGTTGGATGATCTTGAACCCAAGAGAT	ACGTTGGATGTGTTTAAAGGTTTATGTCTTG
rs664894	ACGTTGGATGCTTGAACCCAAGAGATGGAG	ACGTTGGATGTGGATTCCTTCTCTGCTGCC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1594286	ACGTTGGATGCTTGAACCCAAGAGATGGAG	ACGTTGGATGTGAATTCTCTTCTGCTGCC
rs7422168	ACGTTGGATGCTTGAACCCAAGAGATGGAG	ACGTTGGATGTGAATTCTCTTCTGCTGCC
rs565202	ACGTTGGATGGCAAAGGCAATCCATGGAG	ACGTTGGATGCTCGCAGCCTATGCTTGTT
rs1429974	ACGTTGGATGCTTCTTCTGGTCTGATTTC	ACGTTGGATGGAAAGAATTCTATCAAGAAG
rs5829769	ACGTTGGATGGTTGGAGCAGATGTTAAGGG	ACGTTGGATGGATCATGCTTCTGCCTTAAG
rs3056575	ACGTTGGATGGTTGGAGCAGATGTTAAGGG	ACGTTGGATGGATCATGCTTCTGCCTTAAG
rs6708168	ACGTTGGATGATGGTTACAGTAGCACCCGTG	ACGTTGGATGTTTTTACGGCAGCCTGAGC
rs6756743	ACGTTGGATGTGGAATCGCAAGTGTAAGTG	ACGTTGGATGTTGCACATGATCCAGAAG
rs2195598	ACGTTGGATGATGGGCAAGACTCTTGAC	ACGTTGGATGTGCTGTGAGAAGCTTTAG
rs7567217	ACGTTGGATGCTCAAACTCTTCTGGCCTC	ACGTTGGATGAACAGATGCTGGAGAGGATG
rs6756838	ACGTTGGATGCTCCTCAGCTAAATATCCAG	ACGTTGGATGAAAGTGGCAAGACTTGGC
rs666416	ACGTTGGATGACCCCTTGAAGCTGAGGTGG	ACGTTGGATGTCAGAAGTCTTAGGACTGC
rs6761300	ACGTTGGATGCCTACGAAGTAATTTTCTCC	ACGTTGGATGCTATATTGAATGACAAGAGG
rs5829770	ACGTTGGATGCACCTAACTGAGAATACACAG	ACGTTGGATGGCTGTAATTTCTTAGTGGC
rs1429973	ACGTTGGATGAAATATGGCTTGAACCCAGG	ACGTTGGATGTGGAGTGCAGTGGCAGCATCT
rs1429972	ACGTTGGATGCTTCTTCTGCTAACCCTGCTG	ACGTTGGATGCAAGATCTCTGAAAGCTG
rs6756284	ACGTTGGATGTGGGATTATAGGCATGAGCC	ACGTTGGATGTTCAAGCTTTCAGAGAGATTC
rs749988	ACGTTGGATGTTTTCTATTGCTACTACTG	ACGTTGGATGGTGACAAAACAAACCAAGTC
rs749987	ACGTTGGATGGTCTTCAATATAGATATGGC	ACGTTGGATGATTTCAGGGTTTGACTTTG
rs754524	ACGTTGGATGGACTTCTGGGATTTCATC	ACGTTGGATGCTTCCACTCTAAGCCTTAAG
rs754523	ACGTTGGATGGATTTTGCAAAGTAGGTGAC	ACGTTGGATGCTTTGAAAGTGAAGGCTCC
rs675430	ACGTTGGATGATGAGCATGACACAACAACC	ACGTTGGATGAGGTATCTTCAGAGACACAG
rs600012	ACGTTGGATGACTCCAGCCTGGGAGACAGA	ACGTTGGATGGCCTTGAACCTTACACTCAAG
rs614303	ACGTTGGATGCAAACTCACATTCTTTGAC	ACGTTGGATGTTAAATTCCTGCCATGCAC

TABLE 36

dbSNP rs#	Extend Primer	Term Mix
rs1318006	CCCTGACCTGTCACAGGG	ACG
rs1318005	ATGAGAGCCCACCTCCTGT	ACT
rs1318004	TGAGAGCCCACCTCCTGTA	ACG
rs1318003	ACTGGGAGACTCACAGGGA	ACT
rs4327259	GCCACTGGTCCAGCACAG	ACT
rs6756501	GCCACTTTCTCCTCCTGCT	ACG
rs6725189	AGAGAGGGCCGACTGCTG	CGT
rs4665709	GTCCCCACCCAAATCTCAC	ACT
rs4665710	GGCGATTTCCTCTTGGTG	CGT
rs4371387	GTTCCAGCCATGTAGGTTGT	ACT
rs952274	GGGTGACATGCAATTGTGATTT	CGT
rs952275	CCTTCTGCTCAAAAATTTTAC	ACT
rs1801695	ATTATTTCTCTGTCGCAATGG	ACG
rs1042034	GAGATCAACACAATCTTCA	ACT

dbSNP rs#	Extend Primer	Term Mix
rs1801702	GATAAATCTTTCAACAGTTCC	ACT
rs1042031	TTGGTACGAGTTACTCAA	ACT
rs2678378	AGTCCTAGGAAGGCTTTAATT	ACG
rs2678379	AGTCAGGAATGACAGATAGG	ACT
rs1800479	GGTATGGAGATGAAGAAAATCA	ACT
rs1801701	AAAGACCCAGAATGAATC	ACG
rs4362589	GGGCACCTCCAAAATTGATGAT	CGT
rs5742904	CCTGCAGCTTCACTGAAGAC	ACG
rs1799812	GGTGCCCTCTAATTTGTACTG	ACG
rs2163204	GCTGCGATACCTGCTTCGT	ACT
rs676210	AAGTTCCTGACCTTCACATAC	ACG
rs1042006	CTGATGATCTTTACTTTCATTTG	ACT
rs1801696	GAACCTTACTGACTTTGCA	ACT
rs693	GGCCAAATCCGAGAGAC	ACG
rs1041974	GTTGGATTTATTGATGATGCTGT	ACT
rs1041968	TTTGACATGCTCAAGAAC	ACT
rs568413	TGGCGTAGAGACCCATCA	ACT
rs2854726	AGCCTGTAGTCAATAACGCC	CGT
rs2854725	AGCTTTGTGTAACCTGGGTAAC	ACT
rs2000998	TATCTGGTTTGTATCACCACAT	CGT
rs2000997	CAGGATTAACAGAAAGTTCCAA	CGT
rs497166	AGTGCTGGGATTACAGGTGT	ACT
rs562956	CGGCTTCTCCTCTATTCTG	CGT
rs7589300	AAGGTCCCTGACCTTTGAAC	ACT
rs3791980	GGAAAATTAATATTTCCCCCC	CGT
rs3791981	GAGAATGAAGAAACAATAGCTC	ACG
rs1801700	GACTCGTGGGAAGATTGGT	ACT
rs679899	AAGTTGAGATTCTTTCAGA	ACT
rs1041952	CAGAACTCAAGTCTCAATCCT	ACT
rs6727706	TCCCTAGTGATGTTTTGTCA	ACT
rs6719207	TGTAACCATGTCAACAGTAGC	CGT
rs1469513	CAAGCCTCTGGCCTTTGAAG	ACT
rs1800478	CATACACGGTATCCTATGGAG	ACT
rs550619	GTGGCCAGGACTCCTCAAT	ACT
rs6752026	GGGAAGCAGGTTTTCCTTTAC	ACG
rs579826	TGAGCCACAGGTCCAGC	ACG
rs597331	CTCTCAGAAAGTTCCCAACAC	ACT
rs1367116	TTAAAGGAACCTAACTAGGGAA	ACT
rs1367117	AGCCATACACCTCTTTCAGG	ACT
rs1800480	GGCACTCAGCCCCGCAG	ACT
rs1800481	TCTCAGACCTTGAGGCGC	ACG
rs934197	CTGCATCCCCCTTCTCT	ACG
rs1625764	CATCGAGCGCTGGCTGAAG	ACG

dbSNP rs#	Extend Primer	Term Mix
rs1625714	TCCAGCTGGGCAGAGGCA	ACT
rs1560357	CCACTACCGCTGATTCCCT	CGT
rs617314	GTAGCTTGTACATCTGGGG	ACT
rs547186	GGGAAGACTTGCCAAAGACC	CGT
rs589566	TCTGAGTTAGTGCTGTTTAC	ACT
rs588245	AGCCTATCTCGTTTCTGCCT	ACT
rs585967	CTATGAAGTCTAACTGGGCTG	ACT
rs7562777	ATGGTGCCCTCGTGCCTGTA	ACT
rs7575840	TCACAGGGAAAGCCAGGAAT	ACT
rs7567653	ACTTCATTAAATACATCGCCGT	ACT
rs6548010	GGTTTTTTGGTATACATATTC	ACT
rs6548011	AAGGATAGAAAAATATAGTCCC	ACT
rs934198	AGGAGGATGAGTGGGGAGA	ACT
rs634292	CTTGTTTATGGCACAGAAGATG	ACT
rs1003177	CACCATTATGACAGGGCTAG	ACT
rs6726115	CTGGTACTTGGTTAATAGTCC	ACT
rs481069	CAGGACCCCAAGCCCCA	ACT
rs1367115	TGGATTAGTGAATGGGAGGG	ACT
rs666126	GCAGGATTATCTCTCCATATA	ACG
rs7566030	TGCCTGCCCAACCCCTCT	ACT
rs7590135	CACCAGGCTGTTTTAGCAGC	ACG
rs6718513	AAGAACAAAAAGAGGATTGGGA	ACT
rs515135	ACAGCCAAATGGAACCAAAG	ACT
rs1367114	TTGCAGGTCACTTTTTAAAGTT	ACT
rs563290	AACACAGAAATGCAGATATCTC	ACG
rs562338	CATTGTCTTGACAGATGAATGC	ACT
rs581411	TGATAGAGACAGTTATCAATTC	ACT
rs580889	TCTCCGGCTGGGCCGTC	ACT
rs548145	AGAAACAATGACAGAATACTAAG	ACT
rs668948	GGCATGCTGTCTCCTCTGC	ACT
rs594677	GTATTGAACAGGACTGAGTAAT	ACG
rs571468	GAAGAGAAGCTGGCGCC	CGT
rs4665492	CCTATAGATAAGACTTTTATCCCA	ACT
rs622236	GTGAATGAATGAATGAATGAACC	CGT
rs541041	CTATTATGTTTCAGGGGCCA	ACG
rs540156	TACGAGTATATGTATACATTGTC	ACT
rs1367113	GGTAGATAGGGAAGTGGG	ACT
rs1897084	TCTTAAAGGTCCTTTGCAAGA	ACT
rs1897083	TCTATATTTCTTTTGGAGTTTC	ACT
rs478588	CTGGGCAGCAGAAAGAGAAT	ACG
rs664894	GCCAAGATCATGCCACTGC	CGT
rs1594286	ATGGAGGTTGCAGTGAGCC	ACT
rs7422168	GATGGAGGTTGCAGTGAGC	ACT

dbSNP rs#	Extend Primer	Term Mix
rs565202	CAGGAACAATTGGAACTCTACA	ACG
rs1429974	CTGGCTCTGATTTTCAGTTGCC	ACT
rs5829769	GAGGATATATTCCAGGAGATATA	CGT
rs3056575	CAGAGGATATATTCCAGGAGA	CGT
rs6708168	CCCTGCTTCTCAGTACCAAA	CGT
rs6756743	CGCAAGTGTAAGTGATCAAAG	ACG
rs2195598	ACTAAAACACCAAAAGCAATGG	ACG
rs7567217	ACTCTTCTGGCCTCATCTAC	ACT
rs568938	CCTCACACAAAACACCGAAC	ACT
rs666416	GCCTGTCCCACTGGGCC	ACG
rs6761300	GGAATTCCTTCAATAATGACAACA	ACT
rs5829770	CTTGATAACATGTACCAAAAAAAA	CGT
rs1429973	CTTGAACCCAGGAGGCAGA	ACT
rs1429972	GCTAACCACTGCAGCTCCT	ACG
rs6756284	GGCATGAGCCACCGCGC	ACG
rs749988	TCTATTTGCATCTACTGAATTTTT	ACG
rs749987	CGAATAAGGAGCTATCTGTGA	ACG
rs754524	TAGAAAACAAGCTATACATTCTATA	ACT
rs754523	TGCAAGTAGGTGACAATTGC	ACG
rs675430	GTGAAAAATGAACAGATTGTCC	ACT
rs600012	CTGGGAGACAGAGCGAGATT	ACG
rs614303	CTTTGACAATACATGAGCCCT	ACG

Genetic Analysis

[0269] Allelotyping results from the discovery cohort are shown for cases and controls in Table 37. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 (A1 AF = 1-A2 AF). For example, the SNP rs1318006 has the following case and control allele frequencies: case A1 (C) = 0.494; case A2 (T) = 0.506; control A1 (C) = 0.460; and control A2 (T) = 0.540, where the nucleotide is provided in parenthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 37

dbSNP rs#	Position in SEQ ID NO: 1	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs1318006	238	21188688	C/T	0.506	0.540	0.326
rs1318005	294	21188744	C/T	0.044	0.034	0.643
rs1318004	295	21188745	A/G			
rs1318003	347	21188797	A/C			
rs4327259	1425	21189875	A/C	0.962	0.965	0.865

dbSNP rs#	Position in SEQ ID NO: 1	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs6756501	4891	21193341	C/T	0.195	0.141	0.061
rs6725189	5087	21193537	G/T	0.317	0.250	0.036
rs4665709	7041	21195491	A/G	0.683	0.757	0.014
rs4665710	7121	21195571	A/C	0.206	0.209	0.926
rs4371387	7219	21195669	A/G	0.579	0.688	-0.0001
rs952274	7443	21195893	G/T	0.163	0.123	0.158
rs952275	7485	21195935	G/T	0.234	0.319	0.013
rs1801695	10939	21199389	A/G	0.047	0.071	0.319
rs1042034	11367	21199817	A/G	0.191	0.182	0.743
rs1801702	11571	21200021	C/G			
rs1042031	11839	21200289	A/G	0.686	0.785	0.001
rs2678378	12551	21201001	A/G			
rs2678379	12646	21201096	A/G	0.693	0.714	0.466
rs1800479	13469	21201919	G/C	0.144	0.130	0.687
rs1801701	14913	21203363	A/G	0.090	0.116	0.314
rs4362589	15205	21203655	G/T			
rs5742904	15246	21203696	A/G			
rs1799812	15695	21204145	G/A			
rs2163204	17473	21205923	G/T			
rs676210	17610	21206060	A/G	0.186	0.177	0.758
rs1042006	17828	21206278	A/C			
rs1801696	18130	21206580	A/G			
rs693	18281	21206731	C/T	0.494	0.537	0.208
rs1041974	18623	21207073	C/G			
rs1041968	18890	21207340	C/T			
rs568413	21561	21210011	C/T			
rs2854726	23100	21211550	A/T			
rs2854725	23872	21212322	A/C			
rs2000998	24581	21213031	A/T			
rs2000997	24582	21213032	A/T			
rs497166	24983	21213433	C/T			
rs562956	27540	21215990	A/T			
rs7589300	30846	21219296	C/T			
rs3791980	31415	21219865	G/T			
rs3791981	31453	21219903	A/G	0.964	0.968	0.849
rs1801700	31899	21220349	T/C	0.832	0.897	0.008
rs679899	37000	21225450	A/G	0.378	0.474	0.004
rs1041952	38681	21227131	C/G			
rs6727706	39287	21227737	C/T			
rs6719207	42951	21231401	A/T			
rs1469513	45648	21234098	C/T	0.477	0.534	0.079
rs1800478	46222	21234672	C/T			
rs550619	46687	21235137	A/G	0.053	0.062	0.656
rs6752026	47020	21235470	A/G			
rs579826	47593	21236043	C/T	0.069	0.063	0.817
rs597331	48513	21236963	C/T	0.435	0.512	0.014
rs1367116	49723	21238173	A/G			
rs1367117	49986	21238436	A/G	0.431	0.367	0.049
rs1800480	53018	21241468	C/G	0.978	NA	NA
rs1800481	53296	21241746	C/T	0.100	0.082	0.487
rs934197	53547	21241997	A/G	0.338	0.398	0.075
rs1625764	53899	21242349	C/T			
rs1625714	53916	21242366	G/T			
rs1560357	53933	21242383	A/C			
rs617314	54305	21242755	G/T	0.977	0.971	0.741
rs547186	55327	21243777	A/T	0.468	0.490	0.528

dbSNP rs#	Position in SEQ ID NO: 1	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs589566	55895	21244345	C/T	0.386	0.377	0.780
rs588245	56143	21244593	C/T	0.425	0.398	0.397
rs585967	56640	21245090	G/T	0.724	0.781	0.046
rs7562777	58486	21246936	A/G			
rs7575840	59576	21248026	G/T	0.436	0.408	0.422
rs7567653	63048	21251498	A/G	0.918	0.910	0.739
rs6548010	64008	21252458	A/G	0.293	0.345	0.081
rs6548011	64018	21252468	C/T	0.530	0.482	0.135
rs934198	64869	21253309	A/C	0.526	0.484	0.225
rs634292	65995	21254445	G/T	0.456	0.492	0.256
rs1003177	66905	21255355	A/G			
rs6726115	67183	21255633	A/G	0.293	0.342	0.119
rs481069	67942	21256392	C/T	0.138	0.104	0.167
rs1367115	68101	21256551	A/G	0.421	0.408	0.693
rs666126	68521	21256971	A/G	0.500	0.530	0.388
rs7566030	68664	21257114	C/G	0.397	0.416	0.536
rs7590135	68988	21257438	A/G	0.268	0.324	0.082
rs6718513	69178	21257628	C/G			
rs515135	72143	21260593	A/G	0.726	0.747	0.455
rs1367114	74183	21262633	C/G			
rs563290	74312	21262762	C/T	0.667	0.690	0.516
rs562338	74407	21262857	C/T	0.482	0.578	0.006
rs581411	75518	21263968	A/G	0.162	0.157	0.839
rs580889	76153	21264603	A/G	0.127	0.111	0.487
rs548145	77398	21265848	A/G	0.709	0.765	0.049
rs668948	77615	21266065	A/G	0.133	0.127	0.805
rs594677	79092	21267542	C/T			
rs571468	80000	21268450	G/T	0.455	0.502	0.169
rs4665492	80125	21268575	A/C	0.274	0.327	0.088
rs622236	80595	21269045	G/T			
rs541041	81061	21269511	C/T	0.779	0.791	0.694
rs540156	81151	21269601	A/G	0.237	0.277	0.237
rs1367113	81918	21270368	C/T	0.394	0.366	0.370
rs1897084	83072	21271522	C/T			
rs1897083	83137	21271587	C/T	0.279	0.326	0.139
rs478588	83235	21271685	C/T			
rs664894	83263	21271713	A/T	0.319	0.343	0.467
rs1594286	83279	21271729	A/G			
rs7422168	83280	21271730	C/G			
rs565202	83533	21271983	C/T	0.483	0.514	0.373
rs1429974	86856	21275306	G/T	0.583	0.535	0.189
rs5829769	87186	21275636	-TATA			
rs3056575	87189	21275639	-TATA			
rs6708168	87727	21276177	A/T	0.610	0.563	0.163
rs6756743	87978	21276428	C/T	0.051	0.051	0.978
rs2195598	89129	21277579	A/G			
rs7567217	89556	21278006	C/T	0.100	0.087	0.547
rs568938	89702	21278152	A/G	0.177	0.150	0.304
rs666416	90233	21278683	A/G	0.421	0.364	0.093
rs6761300	93060	21281510	A/G	0.271	0.348	0.012
rs5829770	94779	21283229	-T	0.036	0.037	0.971
rs1429973	95367	21283817	A/G			
rs1429972	95844	21284294	A/G	0.422	0.443	0.533
rs6756284	95942	21284392	A/G	0.155	0.114	0.133
rs749988	96884	21285334	C/T			
rs749987	96938	21285388	A/G			

dbSNP rs#	Position in SEQ ID NO: 1	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs754524	97627	21286077	A/C	0.248	0.306	0.044
rs754523	97777	21286227	C/T	0.567	0.512	0.113
rs675430	97871	21286321	A/C	0.352	0.345	0.812
rs600012	98746	21287196	A/G			
rs614303	99663	21288113	A/G	0.722	0.730	0.805

[0270] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1A for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1A can be determined by consulting Table 37. For example, the left-most X on the left graph is at position 21188688. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0271] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter 8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black line provides a local test for excess statistical significance to identify regions of association. This was created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0272] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is placed at the 3' end of each gene to show the direction of transcription.

Example 9

BVES Proximal SNPs

[0273] It has been discovered that rs 1018810 is associated with occurrence of osteoarthritis in subjects. BVES was identified as a blood vessel epicardial substance. Sequence analysis predicted 3 transmembrane helices with an extracellular C terminus. Northern blot analysis revealed that expression of an approximately 5.5-kb BVES transcript is restricted to skeletal muscle and adult and fetal heart. BVES is highly expressed in osteoarthritic cartilage according to EST database analysis, and may play a role in chondrocyte and/or bone cell development. BVES biological activity may be modulated by addition of an antibody, a recombinant binding partner, a binding agent, or a recombinant BVES protein or functional fragment thereof

[0274] One hundred fifty-four additional allelic variants proximal to rs 1018810 were identified and subsequently allelotyped in osteoarthritis case and control sample sets as described in Examples 1 and 2. The polymorphic variants are set forth in Table 38. The chromosome positions provided in column four of Table 38 are based on Genome "Build 34" of NCBI's GenBank.

TABLE 38

dbSNP rs#	Chromosome	Position in SEQ ID NO: 4	Chromosome Position	Allele Variants
rs2400080	6	241	105557091	A/G
rs6930209	6	801	105557651	A/G
rs221628	6	899	105557749	A/G
rs221629	6	2091	105558941	C/G
rs221630	6	2290	105559140	C/T
rs221631	6	2440	105559290	A/G
rs1149284	6	4959	105561809	G/T
rs221633	6	7914	105564764	C/G
rs423366	6	7969	105564819	A/G
rs436460	6	7972	105564822	C/T
rs2211010	6	10831	105567681	C/T
rs379908	6	12399	105569249	C/T
rs1149285	6	13841	105570691	C/T
rs7341194	6	14461	105571311	C/T
rs715153	6	14680	105571530	C/T
rs221634	6	16808	105573658	A/T
rs7757307	6	18231	105575081	C/T
rs221635	6	18394	105575244	C/T
rs4145418	6	18505	105575355	G/T
rs221636	6	18684	105575534	A/T
rs3185958	6	19257	105576107	C/T
rs4946654	6	20263	105577113	A/T
rs221637	6	20656	105577506	A/C

dbSNP rs#	Chromosome	Position in SEQ ID NO: 4	Chromosome Position	Allele Variants
rs221638	6	21499	105578349	A/G
rs221639	6	21563	105578413	A/C
rs643545	6	21612	105578462	C/G
rs221640	6	21834	105578684	C/T
rs3957696	6	22406	105579256	A/T
rs3995554	6	22408	105579258	A/T
rs7453502	6	22685	105579535	A/T
rs1190471	6	23303	105580153	C/T
rs221641	6	23306	105580156	C/G
rs221642	6	25139	105581989	A/G
rs1190472	6	25211	105582061	C/T
rs1190473	6	25364	105582214	A/G
rs186404	6	25381	105582231	A/C
rs221643	6	25414	105582264	A/T
rs221644	6	25835	105582685	C/T
rs1203475	6	26214	105583064	A/G
rs221645	6	27224	105584074	A/G
rs170277	6	27526	105584376	A/G
rs221646	6	27934	105584784	C/T
rs221647	6	28550	105585400	C/T
rs221648	6	29015	105585865	A/G
rs221649	6	29879	105586729	G/T
rs221650	6	29979	105586829	A/G
rs1149287	6	30030	105586880	A/G
rs221651	6	30585	105587435	C/T
rs7762591	6	31753	105588603	C/G
rs7748555	6	31934	105588784	C/T
rs5878833	6	33227	105590077	-T
rs5878834	6	33228	105590078	-T
rs221652	6	35172	105592022	C/T
rs221653	6	36901	105593751	A/G
rs221654	6	36921	105593771	A/G
rs221655	6	36932	105593782	A/G
rs221656	6	37061	105593911	C/T
rs221657	6	37570	105594420	C/T
rs221658	6	38745	105595595	G/T
rs110065	6	38970	105595820	A/T
rs221659	6	39725	105596575	C/T
rs221660	6	40070	105596920	A/C
rs7742821	6	40460	105597310	C/G
rs221662	6	41470	105598320	A/G
rs7748426	6	41562	105598412	A/G
rs6911494	6	41956	105598806	A/G
rs6939846	6	42047	105598897	A/T
rs368471	6	42280	105599130	A/G
rs430190	6	42358	105599208	A/G

dbSNP rs#	Chromosome	Position in SEQ ID NO: 4	Chromosome Position	Allele Variants
rs455114	6	42629	105599479	C/G
rs405956	6	43075	105599925	C/T
rs5878835	6	43387	105600237	-/A
rs1473814	6	43393	105600243	G/T
rs423272	6	43438	105600288	C/T
rs413806	6	44115	105600965	A/G
rs4946655	6	44537	105601387	A/G
rs6915632	6	45642	105602492	A/G
rs2095723	6	46629	105603479	A/G
rs7450078	6	47496	105604346	A/G
rs7453071	6	47515	105604365	A/C
rs1018810	6	48329	105605179	A/G
rs7450944	6	48862	105605712	C/G
rs7748657	6	48908	105605758	A/G
rs1013137	6	49038	105605888	C/T
rs5878836	6	49080	105605930	-/T
rs1981480	6	50204	105607054	A/T
rs1981479	6	50404	105607254	A/G
rs3035187	6	50426	105607276	-/TTA
rs7453993	6	50531	105607381	C/T
rs2001119	6	50840	105607690	C/T
rs2001118	6	50964	105607814	C/T
rs2001117	6	50971	105607821	C/T
rs6940433	6	51378	105608228	C/T
rs1318746	6	52610	105609460	A/C
rs763099	6	53906	105610756	A/T
rs5878837	6	53951	105610801	-/C
rs964731	6	54111	105610961	A/C
rs964730	6	54149	105610999	G/T
rs6921869	6	55563	105612413	C/G
rs3945029	6	55999	105612849	C/T
rs4945715	6	58415	105615265	C/G
rs7775252	6	58961	105615811	C/G
rs7742098	6	60447	105617297	C/T
rs3757289	6	61377	105618227	A/G
rs6905458	6	61528	105618378	A/G
rs3757290	6	61606	105618456	C/G
rs2275289	6	62140	105618990	A/G
rs4945716	6	62461	105619311	C/T
rs6922638	6	63826	105620676	C/T
rs7739572	6	64950	105621800	G/T
rs6901187	6	65076	105621926	G/T
rs4946656	6	66121	105622971	C/T
rs1338020	6	66406	105623256	C/T
rs7771472	6	67051	105623901	A/C
rs6926260	6	68860	105625710	C/T

dbSNP rs#	Chromosome	Position in SEQ ID NO: 4	Chromosome Position	Allele Variants
rs6926627	6	69014	105625864	C/T
rs4946657	6	70796	105627646	C/T
rs6571218	6	72325	105629175	G/T
rs7449944	6	73414	105630264	A/C
rs952175	6	75258	105632108	C/G
rs1890228	6	76347	105633197	A/G
rs1933237	6	76839	105633689	A/C
rs1338019	6	77358	105634208	A/G
rs7453127	6	77822	105634672	A/G
rs7381551	6	77946	105634796	G/T
rs6571219	6	80002	105636852	A/G
rs6571220	6	80024	105636874	A/G
rs2185017	6	80285	105637135	A/G
rs1591720	6	80397	105637247	C/G
rs6925046	6	82075	105638925	C/T
rs6940423	6	82153	105639003	A/G
rs1190274	6	83981	105640831	A/G
rs1190276	6	84184	105641034	A/G
rs1591719	6	85089	105641939	C/T
rs1933236	6	85288	105642138	A/G
rs6905202	6	85330	105642180	C/T
rs1209150	6	85581	105642431	A/T
rs1190277	6	85642	105642492	A/G
rs6926278	6	86433	105643283	A/G
rs1190278	6	86904	105643754	A/G
rs4626463	6	88391	105645241	A/G
rs6924620	6	89042	105645892	C/T
rs1190280	6	90828	105647678	G/T
rs4557552	6	92676	105649526	C/T
rs6932711	6	92881	105649731	C/T
rs1686140	6	94227	105651077	G/T
rs1190281	6	94585	105651435	A/G
rs2308162	6	94616	105651466	-/ATAA
rs1190282	6	94712	105651562	C/G
rs1765907	6	94738	105651588	A/G
rs5878838	6	95253	105652103	-/G
rs1190283	6	95522	105652372	A/G
rs1190284	6	95869	105652719	G/T
rs1190285	6	97856	105654706	C/T

Assay for Verifying and Allelotyping SNPs

[0275] The methods used to verify and allelotype the 154 proximal SNPs of Table 38 are the same methods described in Examples 1 and 2 herein. The primers and probes used in these assays are provided in Table 39 and Table 40, respectively.

TABLE 39

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs2400080	ACGTTGGATGGTGCCAGCAAGTGATGATA	ACGTTGGATGACAGAGCAAGACTCCATCTC
rs6930209	ACGTTGGATGGCTCTGTGGTGCAATTTAC	ACGTTGGATGGGTTCTCTCACTTAACGTG
rs221628	ACGTTGGATGAGTGAGAGAACCAATGTTG	ACGTTGGATGCCAGTTTGGCTTCATTGG
rs221629	ACGTTGGATGCTGTGCCATTTCTCCCTGTG	ACGTTGGATGGCTGATCTTGGCAAAAGGC
rs221630	ACGTTGGATGCTCTTCTCATTGCTGTGTAG	ACGTTGGATGTCATGTGCAAGAGCCAAAG
rs221631	ACGTTGGATGCACTGGCCCTCTATAAATGC	ACGTTGGATGCCAGCCCTGCAATTATTAT
rs1149284	ACGTTGGATGGATGAGAAATTAAGTACAC	ACGTTGGATGGTCCATTGGTTTTCATTG
rs221633	ACGTTGGATGCTTAACAATTTGTCTGGAG	ACGTTGGATGAGCCACATATACCAAAAAAC
rs423366	ACGTTGGATGAGCCACATATACCAAAAAAC	ACGTTGGATGGAGATCTTTGCATGTCAATAC
rs436460	ACGTTGGATGAGCCACATATACCAAAAAAC	ACGTTGGATGGAGATCTTTGCATGTCAATAC
rs2211010	ACGTTGGATGTTTTTGAGACAGAGTCTCG	ACGTTGGATGTTTGCAGTGAGCTGAGATTG
rs379908	ACGTTGGATGTGAGTGGGCAAAATGGTTCC	ACGTTGGATGCTCTCCTGCAGACACATCAA
rs1149285	ACGTTGGATGCCAAATACATTTATGACTCC	ACGTTGGATGGAGAGAGATCCATCTCAA
rs7341194	ACGTTGGATGCTGTAGAAACAGCTAAACTG	ACGTTGGATGCTGACTAGACTCTGACTTTC
rs715153	ACGTTGGATGTTTTGTTGAATATTGCTGCG	ACGTTGGATGCTTCCATATAGAAAGGATTCC
rs221634	ACGTTGGATGTGCCCATACATCTAGAGCC	ACGTTGGATGTTGGTCTGTTAGGTTTCGCG
rs7757307	ACGTTGGATGTGCTTAAGTTGAACAGTGCC	ACGTTGGATGGCAAAGTCTCCAAACATTTC
rs221635	ACGTTGGATGGGAGCAGACAGAGTAATG	ACGTTGGATGTGAGGTAATCATGCTAGGC
rs4145418	ACGTTGGATGTGCATTGCCAGTCTCTTAGC	ACGTTGGATGGGCCTTCTAGTGAAGACTAG
rs221636		
rs3185958	ACGTTGGATGGACACAGATCATACAACCAC	ACGTTGGATGAGCATCAAACTCTGTCTTAC
rs4946654	ACGTTGGATGATGTAGTCAGAAAGAGTGTC	ACGTTGGATGGGTACTGATAAAATTTGCCG
rs221637	ACGTTGGATGCAATCGTAGCTTACTGTGGG	ACGTTGGATGCTGTAGTCCAGCTACTCAAG
rs221638	ACGTTGGATGCACACCTGGCTGAAATCTTA	ACGTTGGATGTGGTATTTCTAGGCGATGG
rs221639	ACGTTGGATGCCCGCATGTGTATGATCTC	ACGTTGGATGCCCATCGCTAGAAATAACC
rs643545	ACGTTGGATGAAATACCCCGCATGTGAT	ACGTTGGATGCCCTAGAAATAACCAATTAGC
rs221640	ACGTTGGATGTAATCCAGCACTTTGGGAG	ACGTTGGATGTTTACCATTGTTAGCCAGGC
rs3957696	ACGTTGGATGAACAGTATGTTGCCCTTTC	ACGTTGGATGCCAGGCAGTCCAAATTAATTC
rs3995554	ACGTTGGATGAACCAAGTATGTTGCCCTTTC	ACGTTGGATGCCAGGCAGTCCAAATTAATTC
rs7453502	ACGTTGGATGCTCCAAGGTTGGAGTTTGTG	ACGTTGGATGTTTCTAGGCTCCTCAGCATC
rs1190471	ACGTTGGATGATATGTGCCCGCATGATCTC	ACGTTGGATGCCTCCCAAGTGCTAGGATT
rs221641	ACGTTGGATGCCTCCCAAGTGCTAGGATT	ACGTTGGATGATATGTGGCCCGCATGATCTC
rs221642	ACGTTGGATGCTTCCACCATGATTGTGAG	ACGTTGGATGAGACATACCTGAGACTGGAC
rs1190472	ACGTTGGATGTGTCCAGTCTCAGGATGTGC	ACGTTGGATGGCCAGCTAAGGTTTGTAG
rs1190473	ACGTTGGATGTTGATCACACCACTGCACCTC	ACGTTGGATGCCCAATGAAGAAGTCTTGC
rs186404	ACGTTGGATGTTGATCACACCACTGCACCTC	ACGTTGGATGCCCAATGAAGAAGTCTTGC
rs221643	ACGTTGGATGCCCAATGAAGAAGTCTTGC	ACGTTGGATGGAGACAGATGAGACTGTCA

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs221644	ACGTTGGATGCTGCTTTCTAGCTAGCTC	ACGTTGGATGTTACAGATGGGTTACAGGAG
rs1203475	ACGTTGGATGTAATCCAGCTACTTGGGAG	ACGTTGGATGACAATCTCGGCTCACTGCAA
rs221645	ACGTTGGATGTGTTTTCTCATCTGCCAATG	ACGTTGGATGGCTGCTGTTAAGGACCACAT
rs170277	ACGTTGGATGACAGGAAGTCTGAACCTC	ACGTTGGATGTTTGGATCAAGAGGTGACC
rs221646	ACGTTGGATGAATTGGCTCTCTCTGCTGCC	ACGTTGGATGTTACAGCAGAAATGGCTGGA
rs221647	ACGTTGGATGTTCCAGCTCCTTTCTCTAG	ACGTTGGATGTTCTAAGAAAATGCCCTC
rs221648	ACGTTGGATGATCATGCCACTGCACCTCCAG	ACGTTGGATGTTAGGCTCTCCAGGACGACAG
rs221649	ACGTTGGATGGACAGGATGAAGAAGAAGGC	ACGTTGGATGCTTCTGATTCTGCCAAGGAC
rs221650	ACGTTGGATGTAATATCCAGGATCCAGCTG	ACGTTGGATGTTGAACCCCTGAATCAAGC
rs1149287	ACGTTGGATGATGGAGGTCTCACCATTGTT	ACGTTGGATGTAGACACTTTGGGAGGCCAAG
rs221651	ACGTTGGATGGGAGGATCACTTGAATCCAG	ACGTTGGATGAGACAGGCTCTTGCTCTGTT
rs7762591	ACGTTGGATGATCTCTGCTCACTGCAGCTT	ACGTTGGATGAAATAGCCAGGTGGTGG
rs7748555	ACGTTGGATGTTGGGATTACAGGTGTGAGC	ACGTTGGATGCCCACTGCTTCACTTGACTA
rs5878833	ACGTTGGATGACACTGCTACACTGCCTTC	ACGTTGGATGACCTGACCTCAAAGGTCTCTG
rs5878834	ACGTTGGATGACACTGCTACACTGCCTTC	ACGTTGGATGACCTGACCTCAAAGGTCTCTG
rs221652	ACGTTGGATGACTTTCTACTCAGGGAAGG	ACGTTGGATGAGTTTACACCCGCTAAGAC
rs221653	ACGTTGGATGGTTTCACTGTGTAGCCAGG	ACGTTGGATGTAATCCAGCACTCTGGGAG
rs221654	ACGTTGGATGGAGATCAAGACCATCCCTGGC	ACGTTGGATGAGTACTCTGGGATACAGGCA
rs221655	ACGTTGGATGGTCAGGAGATCAAGACCATC	ACGTTGGATGCCGCCGCCAGCTAATTTTTT
rs221656	ACGTTGGATGAGATGGAGTTTCACTCTGTC	ACGTTGGATGAATCCAGGAGGTGGAGTTTG
rs221657	ACGTTGGATGAGAACTCTTCCATCCTTGAC	ACGTTGGATGTTCTGTTTGTAGTGATCCAG
rs221658	ACGTTGGATGCCAGCTGAGTTGACGATTTG	ACGTTGGATGACACCCATATCTTCGCTACC
rs110065	ACGTTGGATGTGACATGCTCATAGCCCTTG	ACGTTGGATGAGATCAGCTGCTCATCTGAG
rs221659	ACGTTGGATGCCAAACACAACCTCTACTTC	ACGTTGGATGCAGGTAAGGAAATTAAGGCAC
rs221660	ACGTTGGATGAATATGATGGAACCCAGGGC	ACGTTGGATGCTTATAGCTCTCTGAGTGTG
rs7742821	ACGTTGGATGAGCTCTTGGGAAGTTCTCAC	ACGTTGGATGCCCACTCTCTCAGCTATAC
rs221662	ACGTTGGATGGACAATGGGTTAAATGTTGGG	ACGTTGGATGAAGTCTGTTGAGTTTCTGAG
rs7748426	ACGTTGGATGATTCAACCTCACCACATCTG	ACGTTGGATGCCACCCCTCTGTTTCTTCT
rs6911494	ACGTTGGATGTCAATGGTACAGAAGGCCAG	ACGTTGGATGAACCCCTCGCTGGAAATTAG
rs6939846	ACGTTGGATGTCCTCAAAGCTGGGCTTTCT	ACGTTGGATGAGACAAAAGGATCACCTGCC
rs368471	ACGTTGGATGCCCCCTAATACATCCAAACCC	ACGTTGGATGACCAGGCAACCTGTAGAAG
rs430190	ACGTTGGATGTCTCTGGGAAGATGTTGGGC	ACGTTGGATGTACATCCACTATGTACCCAC
rs455114	ACGTTGGATGCCAGAAATGATTCTTAG	ACGTTGGATGACAGAAGTCTTTCTCTGATC
rs405956	ACGTTGGATGAACTCCAAGTCAAGGACCC	ACGTTGGATGAAGGTGTCCACTGTCTTCGC
rs5878835	ACGTTGGATGCTGTCTTCCAGAGTCTTGAG	ACGTTGGATGTACATCCACTATGTACCCAC
rs1473814	ACGTTGGATGGTTAAGAACCACAGAAGGC	ACGTTGGATGTACATCCACTATGTACCCAC
rs423272	ACGTTGGATGCACAGAAGGCCTTAAACCC	ACGTTGGATGTACAGTGTGCACTCTGTATC
rs413806	ACGTTGGATGCTGACAGATTTTACATCTGTG	ACGTTGGATGGTTTCCAGAGAGTGAACAAAC
rs4946855	ACGTTGGATGCTAAGAGTAGCTTTGGCTTG	ACGTTGGATGTTTGTACGCTTTGGCTGAG
rs6915632	ACGTTGGATGGTCTGTATCTTGACTCACTG	ACGTTGGATGGCTGTAAATCCAGTTACTC
rs2095723	ACGTTGGATGTGTCTCTCTCATGCCAGTA	ACGTTGGATGCTGTATAAAATACCTTCAGG
rs7450078	ACGTTGGATGGCCATCACTCCAGATAATT	ACGTTGGATGAAGGCAGGAGGATCTCTTGA
rs7453071	ACGTTGGATGATGATCCAGCACTTTGGGAGG	ACGTTGGATGATGATTTGCCAGGCTCGTCT
rs1018810	ACGTTGGATGTGCTGCTCCATTTCTCATG	ACGTTGGATGAAGGAGTAGAGACCTTCTG
rs7450944	ACGTTGGATGATTCAGCCACATACACCTCAG	ACGTTGGATGGTTTGTATCAGGACAAACCC
rs7748657	ACGTTGGATGAGAGAGATGGAAGGGAG	ACGTTGGATGTGCAATCAGCATGTAAACG

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs1013137	ACGTTGGATGATTACAAGCAGTGTCACTCC	ACGTTGGATGGGGTTAATGAATAGGTGGAAC
rs5878836	ACGTTGGATGTTTGGTATGGAGTGACACTG	ACGTTGGATGCCAATGATAATCTCCAGTGTG
rs1981480	ACGTTGGATGCGACTGCTCTTCTCTGCGAG	ACGTTGGATGTGCTGCACCTTCCCTACTCTT
rs1981479	ACGTTGGATGTGAGTAGCTAGAAGTACAGG	ACGTTGGATGATCACTGCAGCGCTTAAATCT
rs3035187	ACGTTGGATGTGAGTAGCTAGAAGTACAGG	ACGTTGGATGATCACTGCAGCGCTTAAATCT
rs7453993	ACGTTGGATGTGACAAAGTGAGACCAACTC	ACGTTGGATGTGGGAGATCACCTTTTCATC
rs2001119	ACGTTGGATGGCTCTTTAGGTCTTCATTTC	ACGTTGGATGTGAGTTTGTGTTAAAGCTC
rs2001118	ACGTTGGATGGGTCCAGCCAAAAACAACC	ACGTTGGATGAGGCTGGAATTTACAAGGCC
rs2001117	ACGTTGGATGGTCCAGCCAAAAACAACC	ACGTTGGATGAGGCTGGAATTTACAAGGCC
rs6940433	ACGTTGGATGTTGTGAGCTACCTCAATTCAC	ACGTTGGATGCAACACTGGGTTATTTGTG
rs1318746	ACGTTGGATGTAAGCTGGTCTTATTTCAG	ACGTTGGATGGGTGCCCAATGATCAATAGC
rs763099	ACGTTGGATGGAGGCAAGTTGTGAAGACC	ACGTTGGATGGGCGCTTGAAGTTTCTCAG
rs5878837	ACGTTGGATGTCAACAGCCGTAATTCATCAG	ACGTTGGATGTGAAGACCTTCTGCCATC
rs984731	ACGTTGGATGGGAATCATACCCCTTTCC	ACGTTGGATGTGAGGGATACCTTGAGCTCTG
rs984730	ACGTTGGATGCACCTTGGCAAGGGAATTTA	ACGTTGGATGTGAGGAAGCAGAAAGGTAC
rs6921869	ACGTTGGATGTAGTAGAGACAGGGTTTCAC	ACGTTGGATGTACTTGGGAGGCTAAGATGG
rs3945029	ACGTTGGATGCTCTTCTGTAAATCTTGCC	ACGTTGGATGAGAGAAGGCTGAACACATG
rs4945715	ACGTTGGATGCTCAAGGGACAGTCAATTGAG	ACGTTGGATGTGAGGGTGTCTCATGAATTG
rs7775252	ACGTTGGATGGAAGTGGGATTTTGG	ACGTTGGATGTTTCTTATCCAGCTATGCG
rs7742098	ACGTTGGATGGAAGAAAACAGAAAAGTGGC	ACGTTGGATGAAGAATCTGCTTTTCCCC
rs3757289	ACGTTGGATGGCGATTTTATTTGTAGTACAG	ACGTTGGATGAATACCTTGCCCTCAAGAAG
rs6905458	ACGTTGGATGAGGAATATCAGCCCTTTGGG	ACGTTGGATGGCTCTTCTAACAAGATGACC
rs3757290	ACGTTGGATGTAACAATGCCAGCACACAG	ACGTTGGATGTGCTCCAGAGTAAATTTGTC
rs2275289	ACGTTGGATGTTGAAAAGGAACCTCAGTGGC	ACGTTGGATGGTCCAGTTAGCTTCTGAAC
rs4945716	ACGTTGGATGTAGAGCCTCACTGTGTACC	ACGTTGGATGAAATCTGGCCATTTGGGAGG
rs6922838	ACGTTGGATGGCTTGTGTCTGTGCTTTTG	ACGTTGGATGGCTGCTGTTTCTATTTGAGG
rs7739572	ACGTTGGATGGTTTAAAGAGACATTGGGTG	ACGTTGGATGTCTATTGGACGATGCATTC
rs6901187	ACGTTGGATGTACAGCAGACCCCTTAAATG	ACGTTGGATGGGCTTTTCTTCTACCCACC
rs4946856	ACGTTGGATGTGGGCCAGACGATATAAAGG	ACGTTGGATGTAAAGCTCCCACTTAGGC
rs1338020	ACGTTGGATGTCTGTGGTCAACAACAGTCC	ACGTTGGATGCATCTCAGGCAGGATATAGC
rs7771472	ACGTTGGATGTACCTGAAGGTGAATCTAG	ACGTTGGATGGTACAACCTTTTGGAAAAAC
rs6926260	ACGTTGGATGTACCAAGTGTCTGGGATTAC	ACGTTGGATGTGAGAGTGTGATGCTGTGC
rs6926627	ACGTTGGATGAGGTGTGCACCCATTATCCA	ACGTTGGATGGGATACTATACCCATTACTG
rs4946657	ACGTTGGATGCCAGGTAGAATTTATATGGG	ACGTTGGATGCCAGCATTAATCACTGTATC
rs6571218	ACGTTGGATGCGCACGACACCTTATTAAGG	ACGTTGGATGCTCGACAAATAGGTAACTGGC
rs7449944	ACGTTGGATGAACCTTTGTGCGCCCTGGCGG	ACGTTGGATGCCAGCAGGAGGAGACAGAG
rs952175	ACGTTGGATGATGCTGCCAGCCTTTT	ACGTTGGATGTCAAAACAGCTGGTAGGAGC
rs1890228	ACGTTGGATGTTAAGGCATTCCATATCCT	ACGTTGGATGCCAGAGTGTGAATAGTAGC
rs1933237	ACGTTGGATGGGGTGTCAAGCAATTCCTGTC	ACGTTGGATGCAAAAATAGCCCGGTGTGG
rs1338019	ACGTTGGATGTATGTGTGTCACAAAGGGAG	ACGTTGGATGGCTGCAGAACTCAACAATG
rs7453127	ACGTTGGATGCATCACCTCAGATAGTTACC	ACGTTGGATGGTCACTCCAGTTAGCTATAC
rs7381551	ACGTTGGATGAGTTTGTACCCCTTGACCAC	ACGTTGGATGGTGAATCTCAGAAACAGAG
rs6571219	ACGTTGGATGGACAGACTGAAAGTCTTCG	ACGTTGGATGCTCTTCTCTATGTGATTGG
rs6571220	ACGTTGGATGTCCTATCTGATTTGGAAGGC	ACGTTGGATGAACAAGACGAGAGTGTCTTG
rs2185017	ACGTTGGATGATGTGGGAAGATCACTTGAG	ACGTTGGATGAGCCCGCTAATGTGCATAT
rs1591720	ACGTTGGATGTTGGAATACAGGTGTGAGC	ACGTTGGATGACAAGCCCAAGCTAAGCATC

dbSNP rs#	Forward PCR primer	Reverse PCR primer
rs6925046	ACGTTGGATGGCTTGCTTTTGGAGACAGGG	ACGTTGGATGTAGAGGCTGTAGTGAAGCTGT
rs6940423	ACGTTGGATGGTGCTGGGATTACAGATGTG	ACGTTGGATGCCCTGTCTCAAAAAGCAAGC
rs1190274	ACGTTGGATGCATTAGTCTCTGAGGACAAC	ACGTTGGATGCCCTTCTAACCACTAAATACC
rs1190276	ACGTTGGATGCTGTAAATCCAGCACTTTGG	ACGTTGGATGTAGTAGAGACTGGCTTTTAC
rs1591719	ACGTTGGATGCTCACACATTCCCTGAAAG	ACGTTGGATGCTGTCAAGAACTGCTCTGTC
rs1933236	ACGTTGGATGCCAAGTCATTTGAAACCTTC	ACGTTGGATGTAAGCTCAGAAAATGGCATC
rs6905202	ACGTTGGATGCTATTACAGTGTGAATCAGG	ACGTTGGATGCCCACTCAACATCAATTTTC
rs1209150	ACGTTGGATGCTCCTCCAGAACTTTTGACC	ACGTTGGATGGGCCTTTATTACTTGCTACC
rs1190277	ACGTTGGATGATCATGTGCTAAGCACCAG	ACGTTGGATGCCCTCCAGGTCAAAAGTTTC
rs6926278	ACGTTGGATGTAGAACTCCAGGCTCAAGA	ACGTTGGATGTATTAGCTGGGTGTAGTGGC
rs1190278	ACGTTGGATGAGATACTGAGAAGGGTATGC	ACGTTGGATGGTGCTACTGAATACTAGATC
rs4626463	ACGTTGGATGAGAAATTGCCCAACCAGCCTC	ACGTTGGATGGGTCCAGAAGCAAGACAAG
rs6924620	ACGTTGGATGAGAACAAATGCCTGGCACATG	ACGTTGGATGTGACAGAGTGAGACTCTGTC
rs1190280	ACGTTGGATGTAGAAAGTGCCATCCAAATGC	ACGTTGGATGACAAACTAGGCAGACAGTAG
rs4557552	ACGTTGGATGGCTGCTTTACATAACCCAG	ACGTTGGATGCATTTTCTCGGTGACCTAGG
rs6932711	ACGTTGGATGATCACTGCTCAAGGTCAATC	ACGTTGGATGGATGGTGCAATTTGCATGCAG
rs1686140	ACGTTGGATGAGAAAGAACCTAGTTGGAG	ACGTTGGATGGAACATAGTCTGCATGTGATC
rs1190281	ACGTTGGATGCACCTTTTGTCTACAACCTC	ACGTTGGATGATCTCTTGCAATTTATCTAC
rs2308162	ACGTTGGATGCACCTTTTGTCTACAACCTCC	ACGTTGGATGGCATCAAGTAACATGCACATT
rs1190282	ACGTTGGATGTATGTGGACAGTAGCAACCC	ACGTTGGATGAGACTCAGGAGTTGCTCTC
rs1765907	ACGTTGGATGCTTTCTTGAGAAGCACTCC	ACGTTGGATGGGGAGAATGAAATTCACATT
rs5878838	ACGTTGGATGCCCTGTCAATCAAGGCATAG	ACGTTGGATGTGCTCAGCATCGCTACATC
rs1190283	ACGTTGGATGCCCACTGACCTACAATATAT	ACGTTGGATGGACAGATTGAAGATGGCTAG
rs1190284	ACGTTGGATGATCTTCAAAACTGCCAGAC	ACGTTGGATGGCCAGTGATTTTCAAGTTGTT
rs1190285	ACGTTGGATGACTTGAGTCACAGACATAGC	ACGTTGGATGGGCTCTTGATTATTTCTGC

TABLE 40

dbSNP rs#	Extend Primer	Term Mix
rs2400080	TCCTTTACTTTACCTTTTCTTCC	ACG
rs6930209	GATTTTATGCAAAATATCAGATGA	ACT
rs221628	AAGAATAGACATATTTGTAGATCA	ACT
rs221629	TCTCCCTCTGGCCCAACTG	ACT
rs221630	GACAGGTGATGGCTTGGGA	ACG
rs221631	TGTCAAAATGGAAAGATGATTAAT	ACT
rs1149284	CTAGACACATTGTCTGCTAGT	ACT
rs221633	AACAATTTGTCTGGAGATCTTT	ACT
rs423366	ACCAAAAAACATTTTGCAGATAG	ACG
rs438460	ATATACCAAAAAACATTTTGCAGA	ACG
rs2211010	GAGACAGAGTCTCGCTCTGT	ACG
rs379908	TGGATAACACAGATGCATACCA	ACG
rs1149285	ATTTATGAAGCACAAAGAACAAAC	ACT
rs7341194	ACTGAAAAATTTTTCTCTTTGT	ACT

dbSNP rs#	Extend Primer	Term Mix
rs715153	GCCCTCTAGTGGGCTTAATG	ACT
rs221634	GCCAGGATGACCCAAAATA	CGT
rs7757307	CCCATAAATCTTTAACTAAATAC	ACT
rs221635	ACAGTAAATGAAGGACATTGGC	ACG
rs4145418	TAGCCCTGTAAAGCTGATC	CGT
rs221636		
rs3185958	CCACATCTTAAAGAGGCTGTT	ACT
rs4946654	GCCTATTGAAGAAATCATTTTAGA	CGT
rs221637	ACTTGAGCGATCCTCCAC	CGT
rs221638	CCTGGCTGAAATCTTAAAAAAA	ACT
rs221639	GTGTGTGTGTGTGTGAACCA	ACT
rs643545	CACCCGCATGTGTATGTATCT	ACT
rs221640	TCGTCTGAAGTCAGGAGTTC	ACT
rs3957696	TCTCTCTCTCTCTCTCAC	CGT
rs3995554	TCTCTCTCTCTCTCTCACAC	CGT
rs7453502	GAGTTTGTGTTTTAAAGAACTTTT	CGT
rs1190471	AAGAGTGATAAATGACCAAGC	ACT
rs221641	GAGATGTGAGCCACTGCGC	ACT
rs221642	CCAACCATGTGGAAGTGTGA	ACT
rs1190472	TTATCAACAGCATGAAAACGGA	ACG
rs1190473	CTGCACCTCCAGCCCGGGA	ACT
rs186404	GGAGACACAGTGAGACTGTC	CGT
rs221643	AATGAAGAAAGTCTTGCAATTCCT	CGT
rs221644	CTAGCTCCAAGCCAGGTTAT	ACT
rs1203475	GCAGGAGAATCGCTTGAACC	ACG
rs221645	CAGACCTCAAAGTGGTCAAGA	ACT
rs170277	GACCCCTGCTAGCACTCAGA	ACG
rs221646	CAGGCAACAGGTCACAGAG	ACG
rs221647	AGCTCCTTTCCTTAGGTTATC	ACT
rs221648	GGCAACGAGTGAGACCC	ACG
rs221649	AAGAAGAAAGGCTGGGAGAAC	ACT
rs221650	GGCACAGTGGCTCACACTT	ACT
rs1149287	TCCAGGCTGCTTGAAC	ACG
rs221651	AGCTGCAATGAGCTGTGATCG	ACG
rs7762591	CTTCCGCTCTCCTGAGTTCCA	ACT
rs7748555	CAGGTGTGAGCCACCATGC	ACG
rs5878833	GCCTTCTGGCCATTTTTTTTTT	ACG
rs5878834	GCCTTCTGGCCATTTTTTTTTT	ACG
rs221652	TACTCAGGGAAGGATGTTACA	ACG
rs221653	TGTGTTAGCCAGGATGGTCT	ACG
rs221654	AAGACCATCCTGGCTAACAC	ACT
rs221655	GCTAACACGGTGAACCC	ACT
rs221656	CAGGCTGGAGTGTAGTGGC	ACT

dbSNP rs#	Extend Primer	Term Mix
rs221657	CACCTCCTCCCTCCGACTC	ACG
rs221658	TCAGCATTTGTGGCTGCC	ACT
rs110065	CTCCTTGCTGTTGTGGCA	CGT
rs221659	ATGAATTCATCTGTGCGACC	ACG
rs221660	GGA AACAGGGCTTTTTTTTT	ACT
rs7742821	ATTTCCATTTGTGTGAGTCCT	ACT
rs221662	GAATAAAAAGGAATCACACC	ACT
rs7748426	CACATCTGACTATTATTCTACT	ACT
rs6911494	AGGCCAGGCTAAGTGGGG	ACG
rs6939846	GTGGCCATGACAGTTGCAG	CGT
rs368471	TTATATTCAAGGGAATGCTCTT	ACT
rs430190	GCCTCTGGGCAAATTTCTGA	ACG
rs455114	TTTTACAGTTGGGAGGCAGA	ACT
rs405956	AAGACTGGGACAGCAGCGA	ACT
rs5878835	GAACCACAGAAGGCCCTAAAAA	CGT
rs1473814	GAACCACAGAAGGCCCTAAAAA	CGT
rs423272	GTGGGTACATAGTGGATGTAT	ACT
rs413806	ACAGATTTCACATCGTGGTACTC	ACG
rs4946655	GTAGCTTTGGCTTGTGCACC	ACT
rs6915632	CTTGACTCACTGCAACCTCA	ACT
rs2095723	TCTGTCTCACACAGCATTTT	ACG
rs7450078	CGCTATGTTGCCCAGGCTC	ACT
rs7453071	CCAAGGCAGGAGGATCTCT	ACT
rs1018810	CTGCTTTTATACATGCCACAC	ACT
rs7450944	GGGCTCCCTTTCCATCTCT	ACT
rs7748657	GTAGTGGCTGAATGCGATGT	ACT
rs1013137	CACTCCATACCAAAATAATATAC	ACG
rs5878836	GTGACACTGCTTGTAACTCTG	CGT
rs1981480	TACAATGGCAGTGACCCAGA	CGT
rs1981479	CTACAGGCCTGCACCACGA	ACG
rs3035187	ATGCCTGGCAATTTTTTTTTTTT	CGT
rs7453993	GTGAGCCAACTCCCATCC	ACG
rs2001119	CTTACAAAAGCTTCTGTGCCAT	ACT
rs2001118	CAGCCAAAAACAAACCCATAAA	ACT
rs2001117	AAAAACAACCCATAAAGGAAGA	ACT
rs6940433	TGCCAAGAGGCACATTTTCC	ACT
rs1318746	AGGCTACTAAGTATATTGATTTT	ACT
rs763099	AAAGACCTTCTGCCCATCCA	CGT
rs5878837	CGTATTCATCAGCAACAGCC	ACT
rs964731	ATACCCCTTTCTCTCAGTAT	ACT
rs964730	TGAGGGATACTTGAGCTCTGT	ACT
rs6921869	GTCTCGACTCCTGGCCT	ACT
rs3945029	ATTAGCAGCCTCTCCACTA	ACT

dbSNP rs#	Extend Primer	Term Mix
rs4945715	CTTCTCTTTCTCCTTTTCATC	ACT
rs7775252	TTGAGAATTATTCCTGGTAATTA	ACT
rs7742098	CCAGAAAACCTGGCTTTGCCTT	ACT
rs3757289	AAAAATTCCACAGAGATGATGG	ACT
rs6905458	CCTCTCAGAAGTGCCAG	ACG
rs3757290	GACTGACTCTCTCCCAAAA	ACT
rs2275289	AGGAACCTCAGTGGCATGTAC	ACG
rs4945716	CTCACTGTGTTACCCAGGCT	ACT
rs6922638	GTGCTTTTGTCTCTCTCATACT	ACT
rs7739572	AGACATTGGGTGTTCTCTTTT	ACT
rs6901187	CTGACACATAGCTGCCAGAG	ACT
rs4946656	CTGTTGAAGAGCAAAATTAAACA	ACG
rs1338020	GCAAGACATTCTGAATAGTGC	ACT
rs7771472	GAAGGTGAATCTAGGGAATGAA	CGT
rs6926260	GTAAGCCACTGTGTCCAGC	ACG
rs6926627	AAGGCAGAGCAGGGTCCC	ACT
rs4946657	GTTTCATGTTGATCTCTCTGT	ACT
rs6571218	CCTTATTAAGAGAGAGAGAGA	ACT
rs7449944	GGCGGCAGCTGCTTGTTC	ACT
rs952175	CTGGCGCACTGCAACCT	ACT
rs1890228	CCATATCCTGGGCTATGTGT	ACG
rs1933237	CTTAGCCTCCAGAGTAGCTG	ACT
rs1338019	GTCAACAAAGGAGAACTCAAA	ACG
rs7453127	CTACTCTCTTAGCAAAATTCAGTT	ACT
rs7381551	TTCCACCCCTTCAGCCCC	ACT
rs6571219	CGCTGGGGCAGAAAAAGAAA	ACG
rs6571220	TTCTTTTCTGCCCCAGCGA	ACT
rs2185017	CAACACAGTGAGCAGTGAGA	ACG
rs1591720	GTGTGAGCCACCATGCCCA	ACT
rs6925046	GACAGGGTCTTGCTCTGTC	ACT
rs6940423	GGATTACAGATGTGAGCCAC	ACG
rs1190274	GGACACACCTTTTAAAGGTACT	ACT
rs1190276	CCAGCACTTTGGGAGGCC	ACT
rs1591719	TTGAATCTCTTTTATAGATATGG	ACT
rs1933236	ATTTCTCTGATTCACACTGTAATA	ACG
rs6905202	GAAATTTTTCAGCTTTTGAAGGT	ACG
rs1209150	TGACCTGGAGGGAGAAAAAG	CGT
rs1190277	GCTAAGCACCACGGAGATAC	ACT
rs6926278	CTCCCACTCAGCCTCCC	ACG
rs1190278	GGGTATGCGGTAAAGGGGA	ACG
rs4626463	AGGGACTTTCACACTAAGC	ACT
rs6924620	TAAATATTCAATGCATAGAAAGGAA	ACT
rs1190280	ATGCTGCATGTATATTATGGC	ACT

dbSNP rs#	Extend Primer	Term Mix
rs4557552	ACCCAGTACTTCCTCTCC	ACG
rs6932711	GTCATCACTCCCGCAGTTCA	ACG
rs1686140	CCCTTCCTTTGGAAAAGTGG	ACT
rs1190281	TTTAAATGTGCAGTTACTTGATG	ACG
rs2308162	CCTCCAGTGAAAGCAATTATTT	CGT
rs1190282	GCTGAGAATACTTGCTGGCT	ACT
rs1765907	TGAGAAGCAACTCCTGAGTC	ACG
rs5878838	TGCCAATTAGCACTGAAAAAAG	ACT
rs1190283	CTACAAAATTCGTTACTACATAC	ACT
rs1190284	CAGACGTGGCAGCAGAGTAA	ACT
rs1190285	GTCACAGACATAGCCATTAGA	ACT

Genetic Analysis

[0276] Allelotyping results from the discovery cohort are shown for cases and controls in Table 41. The allele frequency for the A2 allele is noted in the fifth and sixth columns for osteoarthritis case pools and control pools, respectively, where “AF” is allele frequency. The allele frequency for the A1 allele can be easily calculated by subtracting the A2 allele frequency from 1 (A1 AF = 1-A2 AF). For example, the SNP rs1474555 has the following case and control allele frequencies: case A1 (C) = 0.64; case A2 (T) = 0.36; control A1 (C) = 0.70; and control A2 (T) = 0.30, where the nucleotide is provided in paranthesis. Some SNPs are labeled “untyped” because of failed assays.

TABLE 41

dbSNP rs#	Position in SEQ ID NO: 4	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs2400080	241	105557091	A/G			
rs6930209	801	105557651	A/G			
rs221628	899	105557749	A/G	0.716	0.755	0.216
rs221629	2091	105558941	C/G	0.775	0.801	0.338
rs221630	2290	105559140	C/T	0.066	0.049	0.465
rs221631	2440	105559290	A/G	0.147	0.137	0.686
rs1149284	4959	105561809	G/T			
rs221633	7914	105564764	C/G	0.094	0.091	0.911
rs423366	7969	105564819	A/G	0.392	0.418	0.448
rs436460	7972	105564822	C/T	0.186	0.175	0.720
rs2211010	10831	105567681	C/T			
rs379908	12399	105569249	C/T	0.773	0.809	0.242
rs1149285	13841	105570691	C/T			
rs7341194	14461	105571311	C/T			
rs715153	14680	105571530	C/T			
rs221634	16808	105573658	A/T	0.330	0.314	0.630
rs7757307	18231	105575081	C/T			
rs221635	18394	105575244	C/T			
rs4145418	18505	105575355	G/T	0.380	0.377	0.929

dbSNP rs#	Position in SEQ ID NO: 4	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs221636	18684	105575534	A/T	0.807	0.829	0.458
rs3185958	19257	105576107	C/T			
rs4946654	20263	105577113	A/T			
rs221637	20656	105577506	A/C	0.879	0.901	0.409
rs221638	21499	105578349	A/G	0.089	0.072	0.427
rs221639	21563	105578413	A/C	0.934	0.951	0.537
rs643545	21612	105578462	C/G	0.824	0.842	0.486
rs221640	21834	105578684	C/T			
rs3957696	22406	105579256	A/T			
rs3995554	22408	105579258	A/T			
rs7453502	22685	105579535	A/T			
rs1190471	23303	105580153	C/T			
rs221641	23306	105580156	C/G	0.070	0.053	0.415
rs221642	25139	105581989	A/G	0.868	0.869	0.987
rs1190472	25211	105582061	C/T	0.227	0.191	0.244
rs1190473	25364	105582214	A/G	0.722	0.742	0.521
rs186404	25381	105582231	A/C			
rs221643	25414	105582264	A/T	0.550	0.766	~0.0001
rs221644	25835	105582685	C/T	0.695	0.774	0.007
rs1203475	26214	105583064	A/G			
rs221645	27224	105584074	A/G	0.066	0.048	0.344
rs170277	27526	105584376	A/G	0.840	0.882	0.137
rs221646	27934	105584784	C/T	0.866	0.897	0.244
rs221647	28550	105585400	C/T	0.844	0.884	0.102
rs221648	29015	105585865	A/G	0.865	0.891	0.341
rs221649	29879	105586729	G/T	0.102	0.081	0.359
rs221650	29979	105586829	A/G	0.856	0.887	0.192
rs1149287	30030	105586880	A/G			
rs221651	30585	105587435	C/T	0.177	untyped	NA
rs7762591	31753	105588603	C/G			
rs7748555	31934	105588784	C/T	0.670	0.712	0.199
rs5878833	33227	105590077	-T	0.140	0.113	0.338
rs5878834	33228	105590078	-T	0.142	0.114	0.309
rs221652	35172	105592022	C/T	0.172	0.120	0.064
rs221653	36901	105593751	A/G			
rs221654	36921	105593771	A/G			
rs221655	36932	105593782	A/G			
rs221656	37061	105593911	C/T			
rs221657	37570	105594420	C/T	0.924	0.953	0.218
rs221658	38745	105595595	G/T	0.043	0.028	0.421
rs110065	38970	105595820	A/T	0.834	0.894	0.031
rs221659	39725	105596575	C/T	0.048	0.027	0.347
rs221660	40070	105596920	A/C	0.841	0.878	0.133
rs7742821	40460	105597310	C/G			
rs221662	41470	105598320	A/G	0.778	0.879	~0.0001
rs7748426	41562	105598412	A/G			
rs6911494	41956	105598806	A/G	0.043	0.032	0.652
rs6939846	42047	105598897	A/T			
rs368471	42280	105599130	A/G	0.150	0.104	0.074
rs430190	42358	105599208	A/G	0.053	0.033	0.386
rs455114	42629	105599479	C/G	0.059	0.027	0.100
rs405956	43075	105599925	C/T	0.132	0.089	0.063
rs5878835	43387	105600237	-A			
rs1473814	43393	105600243	G/T	0.126	untyped	NA
rs423272	43438	105600288	C/T	0.023	untyped	NA
rs413806	44115	105600965	A/G	0.837	0.895	0.037

dbSNP rs#	Position in SEQ ID NO: 4	Chromosome Position	A1/A2 Allele	F A2 Case AF	F A2 Control AF	F p- Value
rs4946655	44537	105601387	A/G	0.062	0.033	0.128
rs6915632	45642	105602492	A/G			
rs2095723	46629	105603479	A/G			
rs7450078	47496	105604346	A/G	0.261	0.163	0.001
rs7453071	47515	105604365	A/C			
rs1018810	48329	105605179	A/G			
rs7450944	48862	105605712	C/G			
rs7748657	48908	105605758	A/G	0.972	untyped	NA
rs1013137	49038	105605888	C/T	0.699	0.785	0.006
rs5878836	49080	105605930	-T			
rs1981480	50204	105607054	A/T	0.880	0.946	0.012
rs1981479	50404	105607254	A/G	0.052	0.035	0.453
rs3035187	50426	105607276	-TTA	0.033	untyped	NA
rs7453993	50531	105607381	C/T	0.170	0.135	0.222
rs2001119	50840	105607690	C/T	0.176	0.122	0.033
rs2001118	50964	105607814	C/T	0.793	0.883	0.001
rs2001117	50971	105607821	C/T	0.575	0.650	0.035
rs6940433	51378	105608228	C/T			
rs1318746	52610	105609460	A/C	0.140	0.089	0.171
rs763099	53906	105610756	A/T	0.865	0.922	0.029
rs5878837	53951	105610801	-C	0.423	0.463	0.215
rs964731	54111	105610961	A/C	0.865	0.926	0.089
rs964730	54149	105610999	G/T	0.903	0.951	0.022
rs6921869	55563	105612413	C/G			
rs3945029	55999	105612849	C/T	0.972	0.976	0.820
rs4945715	58415	105615265	C/G	0.057	0.021	0.048
rs7775252	58961	105615811	C/G	0.027	untyped	NA
rs7742098	60447	105617297	C/T			
rs3757289	61377	105618227	A/G			
rs6905458	61528	105618378	A/G	0.045	0.023	0.345
rs3757290	61606	105618456	C/G			
rs2275289	62140	105618990	A/G			
rs4945716	62461	105619311	C/T			
rs6922638	63826	105620676	C/T	0.086	0.054	0.120
rs7739572	64950	105621800	G/T	0.920	0.931	0.613
rs6901187	65076	105621926	G/T	0.054	0.026	0.122
rs4946656	66121	105622971	C/T			
rs1338020	66406	105623256	C/T	0.109	0.077	0.145
rs7771472	67051	105623901	A/C	0.035	untyped	NA
rs6926260	68860	105625710	C/T	0.921	0.952	0.196
rs6926627	69014	105625864	C/T			
rs4946657	70796	105627646	C/T	0.224	0.136	0.001
rs6571218	72325	105629175	G/T	0.589	0.677	0.011
rs7449944	73414	105630264	A/C			
rs952175	75298	105632108	C/G	0.650	0.730	0.007
rs1890228	76347	105633197	A/G	0.046	0.028	0.426
rs1933237	76839	105633689	A/C	0.925	0.953	0.175
rs1338019	77358	105634208	A/G	0.888	0.930	0.101
rs7453127	77822	105634672	A/G	0.415	0.534	0.002
rs7381551	77946	105634796	G/T	0.026	untyped	NA
rs6571219	80002	105636852	A/G	0.837	0.903	0.017
rs6571220	80024	105636874	A/G	0.464	untyped	NA
rs2185017	80285	105637135	A/G	0.066	0.036	0.196
rs1591720	80397	105637247	C/G	0.027	untyped	NA
rs6925046	82075	105638925	C/T			
rs6940423	82153	105639003	A/G	0.024	0.029	0.840

dbSNP rs#	Position in SEQ ID NO: 4	Chromosome Position	A1/A2 Allele	FA2 Case AF	FA2 Control AF	F p- Value
rs1190274	83981	105640831	A/G	0.067	0.041	0.183
rs1190276	84184	105641034	A/G			
rs1591719	85089	105641939	C/T			
rs1933236	85288	105642138	A/G	0.892	0.942	0.046
rs6905202	85330	105642180	C/T	0.888	0.909	0.435
rs1209150	85581	105642431	A/T	0.862	0.922	0.023
rs1190277	85642	105642492	A/G	0.158	0.118	0.098
rs6926278	86433	105643283	A/G			
rs1190278	86904	105643754	A/G	0.211	0.147	0.030
rs4626463	88391	105645241	A/G	0.067	0.050	0.383
rs6924620	89042	105645892	C/T			
rs1190280	90828	105647678	G/T	0.890	0.948	0.008
rs4557552	92676	105649526	C/T	0.033	0.025	0.736
rs6932711	92881	105649731	C/T			
rs1686140	94227	105651077	G/T			
rs1190281	94585	105651435	A/G	0.914	0.950	0.140
rs2308162	94616	105651466	-/ATAA	0.127	0.072	0.035
rs1190282	94712	105651562	C/G	0.879	0.937	0.009
rs1765907	94738	105651588	A/G	0.095	0.058	0.143
rs5878838	95253	105652103	-/G			
rs1190283	95522	105652372	A/G	0.054	0.032	0.245
rs1190284	95869	105652719	G/T	0.858	0.921	0.005
rs1190285	97856	105654706	C/T	0.908	0.957	0.017
rs6931398			A/G			

[0277] Allelotyping results were considered particularly significant with a calculated p-value of less than or equal to 0.05 for allelotype results. These values are indicated in bold. The allelotyping p-values were plotted in Figure 1D for the discovery cohort. The position of each SNP on the chromosome is presented on the x-axis. The y-axis gives the negative logarithm (base 10) of the p-value comparing the estimated allele in the case group to that of the control group. The minor allele frequency of the control group for each SNP designated by an X or other symbol on the graphs in Figure 1D can be determined by consulting Table 41. For example, the left-most X on the left graph is at position 105557091. By proceeding down the Table from top to bottom and across the graphs from left to right the allele frequency associated with each symbol shown can be determined.

[0278] To aid the interpretation, multiple lines have been added to the graph. The broken horizontal lines are drawn at two common significance levels, 0.05 and 0.01. The vertical broken lines are drawn every 20kb to assist in the interpretation of distances between SNPs. Two other lines are drawn to expose linear trends in the association of SNPs to the disease. The light gray line (or generally bottom-most curve) is a nonlinear smoother through the data points on the graph using a local polynomial regression method (W.S. Cleveland, E. Grosse and W.M. Shyu (1992) Local regression models. Chapter 8 of Statistical Models in S eds J.M. Chambers and T.J. Hastie, Wadsworth & Brooks/Cole.). The black line provides a local test for excess statistical significance to identify regions of association. This was

created by use of a 10kb sliding window with 1kb step sizes. Within each window, a chi-square goodness of fit test was applied to compare the proportion of SNPs that were significant at a test wise level of 0.01, to the proportion that would be expected by chance alone (0.05 for the methods used here). Resulting p-values that were less than 10^{-8} were truncated at that value.

[0279] Finally, the exons and introns of the genes in the covered region are plotted below each graph at the appropriate chromosomal positions. The gene boundary is indicated by the broken horizontal line. The exon positions are shown as thick, unbroken bars. An arrow is placed at the 3' end of each gene to show the direction of transcription.

Example 10

In Vitro Production of Target Polypeptides

[0280] cDNA is cloned into a pIVEX 2.3-MCS vector (Roche Biochem) using a directional cloning method. A cDNA insert is prepared using PCR with forward and reverse primers having 5' restriction site tags (in frame) and 5-6 additional nucleotides in addition to 3' gene-specific portions, the latter of which is typically about twenty to about twenty-five base pairs in length. A Sal I restriction site is introduced by the forward primer and a Sma I restriction site is introduced by the reverse primer. The ends of PCR products are cut with the corresponding restriction enzymes (*i.e.*, Sal I and Sma I) and the products are gel-purified. The pIVEX 2.3-MCS vector is linearized using the same restriction enzymes, and the fragment with the correct sized fragment is isolated by gel-purification. Purified PCR product is ligated into the linearized pIVEX 2.3-MCS vector and *E. coli* cells transformed for plasmid amplification. The newly constructed expression vector is verified by restriction mapping and used for protein production.

[0281] *E. coli* lysate is reconstituted with 0.25 ml of Reconstitution Buffer, the Reaction Mix is reconstituted with 0.8 ml of Reconstitution Buffer; the Feeding Mix is reconstituted with 10.5 ml of Reconstitution Buffer; and the Energy Mix is reconstituted with 0.6 ml of Reconstitution Buffer. 0.5 ml of the Energy Mix was added to the Feeding Mix to obtain the Feeding Solution. 0.75 ml of Reaction Mix, 50 μ l of Energy Mix, and 10 μ g of the template DNA is added to the *E. coli* lysate.

[0282] Using the reaction device (Roche Biochem), 1 ml of the Reaction Solution is loaded into the reaction compartment. The reaction device is turned upside-down and 10 ml of the Feeding Solution is loaded into the feeding compartment. All lids are closed and the reaction device is loaded into the RTS500 instrument. The instrument is run at 30°C for 24 hours with a stir bar speed of 150 rpm. The pIVEX 2.3 MCS vector includes a nucleotide sequence that encodes six consecutive histidine amino acids on the C-terminal end of the target polypeptide for the purpose of protein purification. Target

polypeptide is purified by contacting the contents of reaction device with resin modified with Ni^{2+} ions. Target polypeptide is eluted from the resin with a solution containing free Ni^{2+} ions.

Example 11

Cellular Production of Target Polypeptides

[0283] Nucleic acids are cloned into DNA plasmids having phage recombination sites and target polypeptides are expressed therefrom in a variety of host cells. Alpha phage genomic DNA contains short sequences known as attP sites, and *E. coli* genomic DNA contains unique, short sequences known as attB sites. These regions share homology, allowing for integration of phage DNA into *E. coli* via directional, site-specific recombination using the phage protein Int and the *E. coli* protein IHF. Integration produces two new att sites, L and R, which flank the inserted prophage DNA. Phage excision from *E. coli* genomic DNA can also be accomplished using these two proteins with the addition of a second phage protein, Xis. DNA vectors have been produced where the integration/excision process is modified to allow for the directional integration or excision of a target DNA fragment into a backbone vector in a rapid *in vitro* reaction (Gateway™ Technology (Invitrogen, Inc.)).

[0284] A first step is to transfer the nucleic acid insert into a shuttle vector that contains attL sites surrounding the negative selection gene, ccdB (e.g. pENTER vector, Invitrogen, Inc.). This transfer process is accomplished by digesting the nucleic acid from a DNA vector used for sequencing, and to ligate it into the multicloning site of the shuttle vector, which will place it between the two attL sites while removing the negative selection gene ccdB. A second method is to amplify the nucleic acid by the polymerase chain reaction (PCR) with primers containing attB sites. The amplified fragment then is integrated into the shuttle vector using Int and IHF. A third method is to utilize a topoisomerase-mediated process, in which the nucleic acid is amplified via PCR using gene-specific primers with the 5' upstream primer containing an additional CACC sequence (e.g., TOPO® expression kit (Invitrogen, Inc.)). In conjunction with Topoisomerase I, the PCR amplified fragment can be cloned into the shuttle vector via the attL sites in the correct orientation.

[0285] Once the nucleic acid is transferred into the shuttle vector, it can be cloned into an expression vector having attR sites. Several vectors containing attR sites for expression of target polypeptide as a native polypeptide, N-fusion polypeptide, and C-fusion polypeptides are commercially available (e.g., pDEST (Invitrogen, Inc.)), and any vector can be converted into an expression vector for receiving a nucleic acid from the shuttle vector by introducing an insert having an attR site flanked by an antibiotic resistant gene for selection using the standard methods described above. Transfer of the nucleic acid from the shuttle vector is accomplished by directional recombination using Int, IHF, and Xis (LR

clonase). Then the desired sequence can be transferred to an expression vector by carrying out a one hour incubation at room temperature with Int, IHF, and Xis, a ten minute incubation at 37°C with proteinase K, transforming bacteria and allowing expression for one hour, and then plating on selective media. Generally, 90% cloning efficiency is achieved by this method. Examples of expression vectors are pDEST 14 bacterial expression vector with att7 promoter, pDEST 15 bacterial expression vector with a T7 promoter and a N-terminal GST tag, pDEST 17 bacterial vector with a T7 promoter and a N-terminal polyhistidine affinity tag, and pDEST 12.2 mammalian expression vector with a CMV promoter and neo resistance gene. These expression vectors or others like them are transformed or transfected into cells for expression of the target polypeptide or polypeptide variants. These expression vectors are often transfected, for example, into murine-transformed adipocyte cell line 3T3-L1, (ATCC), human embryonic kidney cell line 293, and rat cardiomyocyte cell line H9C2.

Nucleotide and Amino Acid Sequence Examples

[0286] Table A includes information pertaining to the incident polymorphic variant associated with osteoarthritis identified herein. Public information pertaining to the polymorphism and the genomic sequence that includes the polymorphism are indicated. The genomic sequences identified in Table A may be accessed at the http address www.ncbi.nih.gov/entrez/query.fcgi, for example, by using the publicly available SNP reference number (e.g., rs910223). The chromosome position refers to the position of the SNP within NCBI's Genome Build 34, which may be accessed at the following http address: www.ncbi.nlm.nih.gov/mapview/map_search.cgi?chr=hum_chr.inf&query=. The "Contig Position" provided in Table A corresponds to a nucleotide position set forth in the contig sequence (see "Contig Accession No."), and designates the polymorphic site corresponding to the SNP reference number. The sequence containing the polymorphisms also may be referenced by the "Nucleotide Accession No." set forth in Table A. The "Sequence Identification" corresponds to cDNA sequence that encodes associated target polypeptides (e.g., PADI2). The position of the SNP within the cDNA sequence is provided in the "Sequence Position" column of Table A. If the SNP falls within an exon, the corresponding amino acid position (and amino acid change, if applicable) is provided as well. Also, the allelic variation at the polymorphic site and the allelic variant identified as associated with osteoarthritis is specified in Table A. All nucleotide and polypeptide sequences referenced and accessed by the parameters set forth in Table A are incorporated herein by reference.

Table A

RS_ID	Chromosome	Chrom Position	Contig Accession No. [1]	Contig Position	Nucleotide Accession No. [2]	Sequence Position	Amino Acid Position	Locus	Locus ID	A [3]	Allelic Variability	OA Assoc. Allele
910223	1	16840936	Hs1_30840_34:10	284197	AL049569	24127		PADI2	11240	F	[A/G]	A
1367117	2	21238436	Hs2_22340_34:13	79834	NM_000384	coding-nonsynon	198T	APOB	338	F	[A/G]	G
1024791	2	102459310	Hs2_22327_34:13	4903934	NM_003854	intron		IL1RL2	8808	R	[G/A]	G
1465621	2	175653334	Hs2_5560_34:14	25660207	NM_003387	mma-utr		WASPIP	7456	F	[T/A]	A
1018810	6	105605179	Hs6_25897_34:13	9729038	NM_007073	intron		BVES	11149	F	[A/G]	A
242392	14	54639492	Hs14_26604_34:1	36569492	NM_021255	intron		PELI2	57161	F	[C/T]	T
8818	15	71960095	Hs15_10351_34:1	45034596	NM_005576	mma-utr		LOXL1	4016	R	[G/C]	C
1395486	16	76223689	Hs16_24953_34:1	3155849	NM_033401	intron		CASPR4	85445	F	[C/T]	T
512294	X	148692251	HsX_11883_34:11	1234340	NM_004224	UTR		GPR50	9248	F	[A/G]	G

[1] Contig Accession Number which can be found in the NCBI Database:
http address: www.ncbi.nih.gov/entrez/query.fcgi

[2] Sequence Identification or Nucleotide Accession Number which can be found in the NCBI Database:
http address: www.ncbi.nih.gov/entrez/query.fcgi

[3] "A" column is the sequence orientation ("F" is forward, "R" is reverse).

[0287] Following are genomic nucleotide sequences for an *APOB* region (SEQ ID NO: 1), an *IL1RL2* region (SEQ ID NO: 2), a *WASPIP* region (SEQ ID NO: 3), a *BVES* region (SEQ ID NO: 4), a *LOXL1* region (SEQ ID NO: 5), and a *CASPR4* region (SEQ ID NO: 6). The following nucleotide representations are used throughout: "A" or "a" is adenosine, adenine, or adenylic acid; "C" or "c" is cytidine, cytosine, or cytidylic acid; "G" or "g" is guanosine, guanine, or guanylic acid; "T" or "t" is thymidine, thymine, or thymidylic acid; and "I" or "i" is inosine, hypoxanthine, or inosinic acid. Exons are indicated in italicized lower case type, introns are depicted in normal text lower case type, and polymorphic sites are depicted in bold upper case type. SNPs are designated by the following convention: "R" represents A or G, "M" represents A or C, "W" represents A or T, "Y" represents C or T, "S" represents C or G, "K" represents G or T, "V" represents A, C or G, "H" represents A, C, or T, "D" represents A, G, or T, "B" represents C, G, or T, and "N" represents A, G, C, or T.

APOB genomic sequence (SEQ ID NO: 1)

>2:21188451-21288350

```

1   attatgcaca catgtgtctgt aaccttttaa aatacagagt tgggaaaaca gcacattctg
61  ccacatccct gacacaaaat tctgtacagg tggcagccgg cctcttagca acgccaccag
121 gagcctggag ttatccaggg gccacggtgg ttcccttagg ccaggtacag ggcggagttg
181 ggagaccttc tctgtggagg aaggagccca tgaaggcagc gctcagacct cagagccRcc
241 ctgtgcagcg tcaggggaca gccttggatg ggccatgaga gcccaacctc tgtRYccctc
301 taagggtgtc ccacggcttc ccaccagact gggagactca cagggaKqca gtttgtttgc
```

361 tgtgctaaga aaatttccca agactctgtg ctggggcactg agtgcaagcca catccctgca
421 caagactccc ttctcacctg ctaccccagg cctctcacca ctaccttgtt caatcgtggc
481 tgtatattctg cctgctaggc acacatagtc tgtacctttt taagtgtaaca ttgggggaaga
541 aggacaccttt ctgtcacgtc cattaccaca aattctgtac aggtggcagc tgggctctgt
601 gggaaaaagga ccaacatgct cagttgagct tagcacctcc tggagccctc ttgacaagc
661 tggagactggc cctgtggagg agacagggtg cccagctgtg gcccagagct tgcgaagt
721 tggaggtggag aaggtggaaa gactatgggg ttgggcaagg aggtataatc tccgcttga
781 gcatgctgtg aggagagcag gtaattgggg ggtggggagg ggtccaggca agggaggtc
841 gagcaggcca tgaacaggcc agagaaaacg ggtgaggaga ggttctggga aggaacgac
901 caaggtgtgg gccttgggtg gagtttcggg ggtgagga gggagctgtg aataatgac
961 agcacgcttg ctctggactg ttttgggctc ggaacagag cagtccctag gctgaagag
1021 cccaatggag tggggacagg caacattctt cgtggtaact ctgtctccag tggcgttga
1081 gtggggatgc atctctgacg aaaccgctct ctttgggggt agatgagaat tcttggagat
1141 ccaggaaatgc agccttcagg cctgggtttg ttctcccggt agtctctgtg acctggcct
1201 ccagagagct gagggtaggt ctgcactggc cctacacctc tgacagacac aaagcagagc
1261 tgggttgaat aacttaatta aatgaaatat tttaacaaga aattctaga acagatgac
1321 ctgctcgtaa gcaagccatc acagaaataa aaagctgacag aaagctgtgt ttctgtccag
1381 gaagagaaag ttcttgcaag aaacaagata gtgcagagag gtcgctgtg gctgaccact
1441 ggctgagcaa gcttgttctt ggagtcagaa ccaggcgacac tcgggaacaca gccctggggc
1501 tgtgactact tggctcagga atgcgtgaac tccagacatc aattcaggca ttccacacaa
1561 ttttctcagg cacctactgt gtgctgggca gtgtgcccgg ctctgggtat caaatgctt
1621 cggcgctcac caggtgctcc tgtgagaggg ctattttgca agatgaaga atgggggtct
1681 agggaaagta tgaacagggg taccactgag gcagagaggt gactggaaat caggtctgag
1741 aactctcaag tccaagctct ttaccacctc acctactctc tacacaacag tctgactgac
1801 aaaggtgtcg aagaggaaac tcgactgcat ttgcaagcgt ctataattgt gctggcccca
1861 tgaagagcca cctctggggc tggaggtgtg cattgtacct tctgggggga atgcaacaa
1921 atctctgtct cacactggag tggagatgga cagagacact ctatccata ctgagaaag
1981 gggcccgaga tcagagtggt tagcttgcat agtggacttc ctggagaggg tggcaattga
2041 gaggaacctg aatgtttctg tagagagta cgggagagtg tggccctaca taggagggga
2101 aagggagtaa gccacacctg agagtgggca gcagagcatg gactgatgag aagtggcagg
2161 aggagactgc actgagagcg agagtggagc ctggctcagg gactgactct ccagggaaat
2221 gttgccctct cactgtgtca gtaagtagta ggtgacagaa acatctctgt ctccctggc
2281 catctcgggt gagtgtgaga gaaatgcat gcatgcacaa gccaaagaa ctccttggct
2341 tctctgattt gattatttcc caggctagaa ggggttttgg aaacagagag tcaattctt
2401 cctgccaccg ggtgcctttg ttccacacca tcttccagtg gctcagtag gacttggct
2461 agggccaacc tgatttaaga aaatccatc aaaaaatcct gacatgcmaa gaagactcat
2521 tttaggtaaa atggtttaca gggtaagagg aaactttgtt ttacaggaat atctccatc
2581 aggtttatct atattgaaa ttcaaatat tctttgattt attcaaggaa atgcccacaa
2641 ttacaggatc atggtgagcg cgtaaaagta gacagggtgt tgttttgttc agaaattagc
2701 ttacaagtag ctcttttttg cagcagagaa attatcttta aactctatcc ctacactcc
2761 cccaaggact cagcccccata ctgcccaggg gactctggag aaggaagagg gactctagg
2821 cgggctgagt cctatgtttg gatgactctc tgctcttgtt attattgggg agtggagtt
2881 gtatgtgcat tccgtccagg catcatggct ttgcccattc cacagagctg agggggagac
2941 cctgactcca cggcttatct ctgtacctgt catagaaaag agtcagacct gggaggttaa
3001 ccagacctgt gagtggggag gcaggggtcc cgggacgggg agtcagaggtt gggaggttaa
3061 cccaactaat agagcatgac agcaagccct cagtcaagctc catgaaactg cagcccttc
3121 catctcccat ccaaaacttt ttctgagaga acaagcctag aaatgccact ttagtgtgtg
3181 tgccttagac gtacagagac ggcagcacac accagtgtgt agttagttgt ctacagagc
3241 tccatgcagag ggaatgatgt tttcagcaa actcagggaa tcccaagag gaggcccttc
3301 aattaccagg ccaataggtg agacatggag gaaaaactgac gagacctcag gggagccccc
3361 ttggaaggcg ctggttgatt tcaagttggc ctggggagtg acacagcgca ggaacactag
3421 atcaaggcaa gcacgtggcc tgggtgtgct tcagcagggc tgggggggtc ttcaagctgt
3481 aagagacatt ctttctgggg ccttggagga ttttgtata gagaataaaa agaaacggtc
3541 acagagggca aagccttaga tggatatagaa ggaacccggg tcaatcagtt actcaggga
3601 atgttatgtt tctctgagtt cccattttac agatgaagta actgatgaac agagaggtga
3661 agtgactgct ccaggaccoc atggctggcg agtggacac ttggaactgt caccacgtc
3721 tgtctcccaa gtgtgctctg tgacctctgt cctctctgt ctctggtat ccagaaatccc
3781 tataagtctc cctcatttgg gccctcccca gattgaacac catgtccagc ctctcatatc
3841 agtgccttgt ttatttctct gccctgaatg cttaggagaa tgcctggcct agagaaaggt
3901 cttaacaaag agctactgaa gcaataattt cgaaatcatt taagtgtctc ataaagacca
3961 aaaaatcagc gtgaagagga gaaggaagca ttttctctct catataatc ataataatga
4021 tgcacttaaa ggcctttacct ttctctctct caaactcacc cctccagatg agaatgagg
4081 taagtcaatt agtagtgcaa taagcaacta accatgaggt cctctccctg ctctccccac
4141 catgagggtc acccaagtgt acccatgagt

4201 cagatcgttaa cctatccgga atgttgagtt tagcattccc tggcttcmaa actataatcc
 4261 tagaaaaacaa agcattttgt tcttgatttt aactatattc aaagagctctg gcagccggcg
 4321 tccagtggtcc atgctctgtaa tcccagcact ttggggagctt gagggtggatg gacatcgagg
 4381 tccaggagact aagaccattcc tggccaatgt ggtgaaccc cactctactc aaatacagag
 4441 aaattatgcgc ggcgttggtgg cacatgccag taatcccagc tactctggag gctcgaggta
 4501 gggaaatgcgt tgaacctggg aggcggaggt tgcagtgagc caagatggcg cccactgact
 4561 ccaacctggtt aacagagcaa gactcgcgtc caaacaataa aacaacaata caaaacaaa
 4621 aataaaaaaa aacacaaacc aaaaaaccca aaagagcttg gcaactgta ctctttcca
 4681 ggacttgcat tcttattccc tattatgttg tggtcagatt ccttcaatga gttgatttga
 4741 attgtaattt tacgtcaatt attttgactt ctgtcaatag aaaaacctcg atcattcat
 4801 tgcgtgtttg ccaggtctcca tgtatgttaa cctcatttaa tctttgtaac aactctgtaa
 4861 cataagatgg gccacttttc tctcctgctc Yagagttgct taacctattt ttctcatgga
 4921 tctccatttt aatgatgaaa actgaaggtt aggaacctca agtgactttt ctgaagttaa
 4981 ataactcatg aatgatgaag cttgaatttg agagcgggga ctctttttga gaggaggtaa
 5041 gtattgactg ccttggttcc cagcctcagc tcaacagagc tatgggKcag cagtcggccc
 5101 tctctattgt tctttccagg atcatccaac atccccatgt attatagaaa tgttetaagt
 5161 actctagctc tgatcccaact tcaaaaggctt taggtctcct ggagctatcc tgagctccat
 5221 tactccagaa agacctttgc accagccttg atgagcccca cctgatgaaa aacagagaga
 5281 atggagagga aattggtgga gctgggctat tggctccagt gtgctttcct taggcactgt
 5341 tcttgggtga gaacttaaac tctggatgcc tctgctcact gtggttttgg ttctatgctg
 5401 cacagctgac agcccaagcc acagttttaa aacaagggtg ggagcacagc tctctagctc
 5461 attgaacctg ccactttcaa ggccgtgagc atccctctca ccccaagaat gggcttttgg
 5521 ggtgtcagtc caggagtaga aatggacaca agtgtcagtt ttatggccta gtcccttgcg
 5581 attgttgact tgaagcactg ctcatgactg gggaaagcat gaggcactct gacttagaga
 5641 ataaaggagc ggccctctcc ttgtgaaac atgtgcactc actccaacca cttttatgag
 5701 gccctgggat gttattttgt ggtgaccacc caacctccc accaacaat gggagcactc
 5761 gaagggagtt acagctgacc tcttaatgtg aaacagcata caaggagatg agctaaaggg
 5821 tagggctctt tctgacatc ttactctcgg ttattagaca cttttagagg gaacatctgt
 5881 ttgtccactc tggctcccat attgcaggcc ccatgttagg gccagcttgg cccctctctc
 5941 gactgaattg tgaactaagt ataaattaga ttcaagaagg gaactagaat agggagttag
 6001 agggggcttt gctcaactca ccaaaaaagg ggaattgagc tattcaactc accgggcttc
 6061 aagtaaaaaa cagaagaaaa ttgaggtagc tctgaagaca tctggtgggt cagctctcca
 6121 ttggaccatt ttcttatcag gtttatcctg aggcacgac cactactcta ggcgggactc
 6181 gggagctcaa ccaagcaca cagcttgatc atgtctctga agccccagg actctggggt
 6241 ggctccattt ttgtatttct cctttggttg aaaactttag atatttggtt aatgggagga
 6301 atatctgtat ttatagcagg actttccacg tcacctcaca gtagtctctt agcagatgta
 6361 cctgttgact tactccagc acaatagggc aattaactgt aaaaaggaa atctattggt
 6421 ttctctgttt aagtttctaa agatacttat acaaacataa aattaatgca attttggtt
 6481 aaaaactcta tttttcccta ctcttttggg tattgtttct ctagcccaca ttccaactg
 6541 gccgtctaga tatctctgct tagacacatg attgcaaatg gaaactcaat atgtgatcca
 6601 ttagtcccat tccagctgtg atagtcaatg agtccatgtc ttataactat gatctccac
 6661 tcaacacatt cctccatttt ctactgagcg tccaatgtcc tccaatgtac acaggtctgg
 6721 aattttctaa ctctgaagtc tgcattacct attcttctct gttcctatgt tctctctct
 6781 ctctcctgca accctccagc ttccgggctt cagtgactta ccaaggcaac tccaattctc
 6841 agagcttttg caccatcct ttgtgtttta ctcaatcagc cactgtatc tgtaactttc
 6901 gcccttccaa tcttcttcta tctacacctc ctcaacctc ccaacctcag gacttgactg
 6961 aggtgctcct catctgtttc ttggaacctg gcacaaacct atagatgtgg ttgtggctg
 7021 tgcctccacc caaatctcac Rtaaatgtt aatcccaat gatggagtg ggcctgtggt
 7081 ggaggtgcat ggatcatggg ggcggatttc tcttittggt Mtgctctcgt gatagtagt
 7141 gagttaacta gagatctggt tgtttaaaag tctgtagcac cctccacac tctcctcgt
 7201 tccagccatg taggttgtRc ctacttcccc tttaactct gccatgat taactttct
 7261 gaggcctccc cagtcatgct tctgtactg cctgaggaac ctaagactga ttaaacctct
 7321 ttctttttta aataccagc tctcagttat tctttatagc aatgccagaa cggactaata
 7381 cactcatatt cagattccacc caatataaat tcaattatca tcaatttga tttgtgtttt
 7441 cKaaatcac aatgcatgtc accctctcgc tcaaaaactt ttaactgtat tctctcagca
 7501 aagagagtgct catctttttt ctctgacatt ctagcctctc agagctactat agactggcga
 7561 tccagctcct ctctccttat ctttctctgt ctttggctaa actagataat ccaagttctc
 7621 tacaacacac ccaactatca tcttttactc gtcttcttcc tagaccacc tctctctcat
 7681 ctgtttatta aagtcaatgt atatctgaga tccattttca tctttttctat aaaaatcccc
 7741 tgaattcaaa ctttctctt ttaaatccct catagtaact ttgttatata ccaatgaga
 7801 aaacacgttt cacttttgac agataaaatg gcagacagac ctccaggaac tgcatttata
 7861 tgaattctgt ctctctata gagccactag acagtgctct acacatagag gtgtttatc
 7921 aatgcacact gaaccagaca cgtagccctg cctccattct tctcttctgc cataacgta
 7981 ttttaataat catctaataa taatggcagc ttttctctac aggacatata aggttcgaga

8041 actctcaatat atgtttatttc aactgatttt catgaaaaagt cctgcaaggcc aggcagagta
8101 gatattattct ccaatttcata ggtaaagaaa ctgaggtctg caagagtgaa ataatgtgca
8161 ctgagatcaaa gcaaaaaaaa aatgtaagta ttaattgaac cagagaagta tccaagatgt
8221 caqtagaaga cttcaaaagg gaqcaaggcaa agtccaagtc cccacaaggc cctctgttgc
8281 ttcaaaattct attcagtaaa acaaaagacat tctgagctca tcgaaggccc tttgtatgtt
8341 ggcacactggt caaggaaactg ggcagtggtt accatgtgac tgcacaaacta ttttggattg
8401 gtggctatttt ttttttcttt tccagcactag atagatatca acaaaataagc actgggaatc
8461 tttgtctccc ttttttccct caaattaaag cacaattcca ggcctctctt catgttgaac
8521 actcactaaa tttttgtctg ttatagctca tcagggaaac tcttgcaagaa ctactctctg
8581 aactattcca tgtgtgtgct ttgggatttga gtctaatttc catgttctca cctgtctcaa
8641 aactgacccc tcaatttatcc actcatttat tctgtcacc acccatccat ccatccatcc
8701 atccatccat tatccaacag acttctcttg agtaccagat tcatacacta cagtattata
8761 gctccataga cttctttctca cttctcagtt caqtacagaa gaalatattt aagcattatg
8821 gtttctcttt ccaggtaaag cctgtgcatt ttaacagtgg gcttcacaa gaagtgtgga
8881 agctttatga aagaatgggt gaggttgaag gatttttgaa ttaaaaaagg aggtcttttc
8941 caaataagacc tcatgtagga tttgggaggt ggtgacctcc aatttcttat tgcocccaa
9001 ttacacttct cttgtctctt cagtgtcatg gaaaagaagt cgtgttttta tatctacctt
9061 tgtcagtaaat atagtgcaa gttttgttgc acaggttttt tgcagctctt cttctctaga
9121 gctcagcttg gaggctctga ctggatattg ccaggtttta aaatcagagt tgatagtagt
9181 tggatgtgac agggagaaacc cttgggtttt tactacactt gggattgttt gtaattatga
9241 ttgaaaaaat aaggatgctt aagagcctaa agagcatcaca tgtatgctgg gtacacagaat
9301 tgtttagaat ctacatctcc accctctctc tcccaatcat acttctcttg ctttgaattg
9361 atctctggcag agctccaggg agacatctgg ggtccgtatt gccatgaagc cctgggggtt
9421 aggcactccat agccattctt tctccactcc tggcaggtg agtgaataaa aggtattgtt
9481 atttcacttc gaggcctacc ggagagcctt gccttgcaa ggagacagct cagtgaagaa
9541 gactatgtgg cacatgaaga caccagaggt gttctcaggt atcaaaagt atcaaaagct
9601 tttgtaatat ttttctcttc tcaactggca aatacaattc ctgaatcaa taactctctc
9661 ttttttaatt tttctctgct ttttaacta tttataaata tttataaata tttttaatta
9721 attataaata ctttaattat aaaaatagta attataaata ctttaattat aaaaatagta
9781 attataaata cttataaaaa tatgtaatta taaaatagta aatataaac attttaatta
9841 taaaatagtg aattataaac attttaatta taaaatagtg aatataaac attttaatta
9901 taaaatagtg aattataaac attttaatta taaaatagtg aatataaac attttaatta
9961 taaaatattt aattataaac attttaatta taaaatattt aattataaat attttaatta
10021 taaaatattt aattataaat attttaatta taaaatattt aattataaat attttaatta
10081 taaaatattt aattataaat attttaatta taaaatattt aattataaat attttaatta
10141 taaaatattt aattataaat attttaatta taaaatattt aattataaat attttaatta
10201 taaaacacaa attacctcat ctttttaaat atttttgcaa aattattccc tccataattt
10261 ctccgtttcc atttttatc tgttacttaa atcacactat gtttctaga ggtttgtg
10321 tgccagaata ttttatcaat gccctcgttt cactgtcttt caatacaaat aagtttaga
10381 cagtgtgata atacacaa aagactccat ttatttgttc cctctccccc aagtttaga
10441 aaataactca gatcctgatt tcttttaact tgcaaaaaat gccatctctc tggattcaga
10501 gacctctcga gccctggtgc cagctttgtt gcaggtccag ttcattatgt cttctctgta
10561 tagtctcact cctactgcaa ggcctggctca ctgtatggt ttatacaat aggcagtttg
10621 aatttttctt gtgctatgtg aaagtccaat tggaaaaaga gaataaatga agatttctt
10681 taaaaaattg gaggatgata gtaagtcttc ctggaagca cttcattgat gggttcatga
10741 ctgtctgttga ttgcagcttt ttcagtaaat cctgtatgta tatcaagaa actagttatg
10801 tttgaaatgga caggccaatc aatcttttgg attcagaat aatttttca tagtaatcag
10861 agagttgtgt tgaaaaaact tgcagtttat atctaaact cgtgtgttaa tgaagttaa
10921 ttttctctgt cgaataggYc tggcctttaa ttatttctg agcagtgga gaaagctctg
10981 caactctctc tttccctttt ccatctggat cgttaaggat agttaaagt taactgata
11041 tctgtgcaag aaattgtcca acttgactgt agagtgtgga agttaaagt taactgata
11101 caatatattc agaatggaag tccataagag caactaacag gttcttgat cagactgata
11161 ctttttcttc aagttcataa tatttcactg tccagccaac tatacttga tcaaaatatt
11221 cttcacgaag gcccataatg tattgatgaa tctctgttaa cttcttgagaa actaggtctg
11281 gctcgttttg aataaattca ttgaacttat gaagattgaa gcataggttt ttttcaaca
11341 atttaaaaaa atatgggata taatcaYtga agattgtgtt gatctcatc tggataata
11401 taaataagata agtaaatctc atctctttca gctgtttaa gttatctct attagtgga
11461 aaatgaaatt taaaaggctc tgaagattac gtgagccctc tgggtctctg agagactgta
11521 tggcttttaa taccctttg gcttctttt gctgcaagg aagtgtatc atactagctt
11581 agatatactc tattaagttta tctgaacct attgagctt cgaataaac tgggacagta
11641 ggaataagga aaacagattt tctgaacct aaagtctct cctagtgtat atccagagta
11701 cgtccctcac cctccctatg aacataagtc ggaagtctc gaaatcaat atcagatgtt
11761 tcccgggaaa ctggaattctg ggaagtctc gaaatcaat atcagatgtt
11821 tgaacttcat atggaattYt tgaataactc gtaccaagcc atcaaacagc tatctctgta

11881	gtccctcgaa	actgctctgg	ccttctctgag	tcaacagcttc	ctggtacaga	ttctgggect
11941	gtctcttcca	ctcttggttag	gtccactggc	gtccactggc	ttcttcttgc	aactcactgc
12001	cgatatcctc	aattttgccta	atggccctct	gataaaccca	ctcagcattg	ctctgcaagt
12061	ttcttctcag	ctctgaaagc	acttctctca	gggtgagccc	ttgtgtgtcc	cagctggtact
12121	tggttgacata	atcataaagg	accctctgtg	ctctgggcag	gttgccttgc	agagaggtta
12181	cgaaagccaga	agctgcctct	tcttcccaat	taactttgat	ctgagtttcc	tcatcagatt
12241	cccgccacct	caactcagtt	ttgaatatgt	tgagtttttt	actctggagag	gactaaacag
12301	agagaaaaaaa	aaaaataaca	tgtttttcaat	tactccaatt	acacataact	gacatacataa
12361	actctcatag	cagttaaaaa	taaaagatcag	agaattcttct	ataactctgaa	agggatttat
12421	ctttctcatgt	ctgttctcat	tggtttgtttt	atggttaaat	atgactactga	ttgttaattt
12481	ctctttataca	catgccccag	aaaggatttta	acaaaaacgc	tttgtgtttg	tcatttatcat
12541	tggtcacttt	Raaattaaa	ccttctctagg	actgaaact	ggaagagagag	tggggggaag
12601	agaaagagaga	ggagagagaga	gaagagtcag	gaaatgcagac	ataggRaaag	aaagaaatagc
12661	aaaaaaggga	agtgtgagcc	caccttgcaag	agaccagaaa	tcccaacatc	agatccactt
12721	ctccaagccc	atgcacaaat	tttagtaaca	gtcatagaac	catgttttgtt	cttctctctt
12781	ggtaatgctc	ccttgatttt	ggccctggcca	gagcttgtaa	atgcacagag	aaggaattga
12841	tgatatctcat	ctagcaattc	tattgtgggg	aaagaatttta	aaagttttaaa	tactacaagaa
12901	accgcctctc	ctcgaaaaat	ataccctgcc	tatggctgag	cttgccatag	atttagatag
12961	tgaggatata	ccctcatctt	cctggatttg	cccgaaatta	ataaataata	gtgtctgatgg
13021	gatgtcatgt	gtgcatctaa	acattaaaaa	caatcacagg	ctcatgttaa	tactttctag
13081	agaatatttt	ctcagagaa	aagtgtctta	ccgcctctct	tctccactagt	ttggggaaic
13141	tctgaatttt	gggtcctgaa	ttaaattgat	ctgcaccaat	ttctccactgt	ctcttggggg
13201	cgtgtcactt	attaggttgt	atttaccctga	gggctgtagt	agaaagttcca	tttaagaattg
13261	tgctcatctt	catccatact	catgccacgc	gtccctacgg	ctggggagag	cttgaagaaag
13321	gagatgcttt	tcttgtcttt	ctgtgagcgc	agatggagat	ccgtgaaacgc	tgggcttttc
13381	attattgaggt	gcgcttttcc	ttcccatctc	ctgaaagcag	aaaaacagat	gagctatcac
13441	gaaagggggt	tgagagtgaa	gaaaatcaSa	atgagtttct	aaaaggtata	aggttttcaat
13501	tcaataaaaag	ctccatactg	agtcctctca	tatttgccat	cttctcata	ttctgcacat
13561	aagtccacgt	gtgcaaatgt	tcttttagtc	ttagagagcta	atgactaccat	ttcagttttg
13621	tggtgttcca	aaactgtata	ggagagattt	tgatatttat	tagattcata	acagtaggac
13681	gttgatgatt	tcattgtgaa	aactgggaga	attctatctc	aaccagagata	tctactttgt
13741	ttttaaataat	gcaatgtaca	gtccacactt	atttttaaat	aaatagtgtaa	aaagcatctg
13801	tagtctctaaa	ataattacag	aaaaatccat	ttcttttaaa	gctgtttgttc	ttgaaatgaca
13861	ctagattttc	tacagtttgg	tttttactgt	tagggatatac	atgtatctct	tttcttactt
13921	aaaaatttgt	gacattgagt	aattgtacat	ctactcacaa	ctaaatcacat	aattattttac
13981	tcataactct	cattgaaaat	atacagtatc	taggagagga	ggcaggatat	tctttaccat
14041	ttagttcata	ttctaggaac	tgtacggttg	agctgcagtg	ggaaatccagg	actgtttcaa
14101	cataactctc	tttgtttttc	aaactggcac	tccaagtggc	attatacacg	ggagagttcta
14161	cctcaaagcg	tgacgtcagt	gcttgaaaag	aaggaatgac	aattccagca	ggcacagaga
14221	actttaatgga	gggaatctca	atggtctgct	caggcacgat	gatgtgtggc	aactcaaagt
14281	ctgcgactct	gttggtact	gcattttagat	ccaaagcagc	aatggccatct	gaacacactt
14341	ttggaagcgt	gaactgggac	acagtttaact	gagatctcag	cacggtttatc	tgaaaaaagg
14401	gaatcacaaga	gtcttctggt	tgagaataatt	ttgttaaacac	atacaactca	gggaattttta
14461	ctccgggagg	tggtgttagg	ttgagggcaa	atgatgaagt	tctcagcttc	ttatagattt
14521	gtattttctc	gaagtcaagt	ttgcacgatg	gaacctgaag	atctgtaaat	gggacatgga
14581	acgttaggcat	gacaagaact	gaatttagat	cattttagatt	caqcccacgat	ataatgaatt
14641	tatcagccaa	aactttttaca	gggatggaga	atgaatagcc	attgggggttt	ttggtgtaca
14701	caaaagcgct	tgaaacacga	agatgctgtc	tcttccaat	gctgttggtt	actccagctc
14761	ttaggaattc	ccataagctc	ttgtcataga	ctggttaggat	gatatttttg	aggaacctta
14821	gggtgtcctc	taaggatcct	gcaatgtcaa	gggtgtgcct	ttcttgtgta	ttggaagctc
14881	cgacgtggct	ctggaagagc	ccagaatgaa	tcYggacttc	atttttccat	ctgactctct
14941	ggttcttagt	gttagcattc	agggccactt	cctggccaag	gtcagggaaa	ctttaggaag
15001	aactgggctg	acttgcatgg	acctgaacaa	gagctgacat	ttgccatgga	gagagtttcca
15061	gggtgtcctt	gttgtgatgt	tctccgttgg	tgaaaaagag	gcctctagga	tgttaagtgt
15121	tttctgactc	gtgctccagc	agggaatata	tgctgtggag	ttgctgctct	ccagcaaaat
15181	tttcttttae	tcaagggttc	cagaKatcat	caatttttga	agtgccctgc	agtcctcact
15241	aagacYgtgt	gctcttggaa	ttcaagttag	tggtgctctc	actagcaata	gttccgtgaa
15301	attcccgaga	aagaaccgaa	cccttgacat	ctctcttggt	agatgactca	atgcataaag
15361	aagaggtgag	gctttccaag	ctaagcttgt	ggtaactcgc	tctcttagcg	gttagagtaca
15421	gcattgagaa	attgaaatca	tacttaaat	ccatggagga	agagacagta	aggtttgact
15481	tggtattttc	attaagtctt	tgcttgaaat	tcatcttcaa	aatttggaatt	tggtgttttg
15541	tggtttgtgc	cactgacact	tccatatttt	tcgtgtgtta	gctcacaagt	ctgttatgac
15601	tacctctcac	aaattttgtg	ctcagagaca	gagctgtggc	taacttcaat	cccccttttc
15661	tgttcaactt	tggtgtgccc	tctaatttgt	actgYagtgc	atcaatgaca	gatgaagatg

15721 aagaaaaggag atgagcaaca atatctgact ggttaaaaaag ttcagcattg gtattcagtg
15781 tgatgacatc tgattttaaag gagaaatcat aggttaattt gcccatggca ggaataaaaa
15841 tatggcttat ggtacacaaat tccttgaatc ctgggaagaga aaagcttgaga tttcttaggga
15901 catgaaggac ttgcgactct aatgatggca gattaatgt gtatgaaggc acccggaact
15961 cagaacctag gatggagaaa ctaggcagtc tgactgctt tgggaaacaa tgatccgaat
16021 ccgacacttc tatggtgaat ggagacactt caacatfgac aactggaaca tggatccag
16081 gaatttgaaa gttcctgggg agctcgtcgt gagatttttc agctttgtac ttatcaaaact
16141 taattttttg ttcattatag gatttggta caaaaactaa tggattgtt ctgttttttt
16201 caaaattgcat gtcaaaaggat ttgatgctct gactgataaa ctcaaaaagc acacgcaaaag
16261 gatttggctt ggaatggcgt tgtttgtttt tctataactg agcttttaac attgtaaaag
16321 atgattgctt tgtcgttttc aagaattcct tcaagcctgt tttttccat agagagaaat
16381 ctttcagctg aggagttgtg attattgtgt aaggtagacg catttcagga attgttaaag
16441 gaattgttaa gaaatccaga tttgctcttc catttattcc tacatgggag tccataaag
16501 tctcgttgtt tccagcagag aaattttggg tgtacttata ctgattgaac ctgacactta
16561 ctctgcacat tgcctgtcgt gcactgggac tcagaaaacg tgcattgta ttcagggaag
16621 ctactctccc ttttaacctt aatggaaaac gaactttcaa attcccttca cgtttgttg
16681 atgcctgtat ctcaaatggc tgggctgaaa agaaaaagaga atttttcaaa gtctccaaa
16741 cttctctccc taaatgagca tcatgctccc cagttaactc tgccttcccc tctccaaaac
16801 gtgcatcgcc tttagcagtt agaacactgt ggccccacatg ctgggaatcg attctgtatt
16861 gaatttcaag tttagaaaaag ttgagggagc cagatctata aaccaaaattt tggttttact
16921 ttaggttgtt gctattgatc ttattggaca gtccaaaagga agtgaagggtt cctctatgg
16981 tgaaaactaa ttgtgattca tgtgttcccc catctgagaa tctggggcag gccctatttc
17041 atgacctttt tccagaagaa gtccatgcta tgtggccagc tttcaaacat gtcttgaat
17101 cgttgcgcag gtacgcctga ctagagaagt ccagtttggg gatgttcaat attgttaaag
17161 attattgttt gctatccagg gtaagctgat tgtttattct gacaatcact cccattacta
17221 cctcagctgt atttttttct gtgtgtaaac ttgccactgt ttgtatttt cccctaagat
17281 catttccaaa aaacagcatt tcaactccat gctccgttct caggtaactgt ctggagaact
17341 tcaactgact cttcagagcc agcgatttaa tcttagggtt tgagatttgt cgtttgtctt
17401 gaaaatcaaa attgagaatt tctaatttgg actctccttt ggcaagtgt gaagctgcga
17461 taactgcttc gtKtgcgtg gtggttccat tccctatgtc agcaattgca tctaagtgtg
17521 aaagaggaga ttggattttc agaaactgtc atagctctgcc aaaagttagt acctaaatg
17581 tgtgtgagat gtggggaagc tggaaattctR gtatgtgaag ctgaggaact tgaataatc
17641 taaggttgag agttgggatt atgaattctg gaattgcgat tctgggtaaa cggaaagtctg
17701 gcaggttgat tctcgttaga ggaatgtcct ccacctcag accctgaga tatatactg
17761 gaacggggcca ctgcagctca ctgttcagca tctggccaat ggttctgatg atcttactt
17821 tcattttKac aaagtcaatt gtaaaaggag gaatgtggaa ggtgttaaag atgttaaatt
17881 ctggtgtgga aaacctggat gggattttta tattttttaa gtctttgaag tttattctga
17941 ctgatggaaat cctcaaatct gttaggggga ctataaaaac aggtgtctgg aaggtagctg
18001 tctgaagagc ctgaagactg acttcaaaag caggcatggt cccaagactg gtcttgattt
18061 caggaacagt gaacctgtgc tctaccaatg ctctcatagc tttagcccaa tcttgtagat
18121 aatattctgtY tgcaaatgca gtaaggttct tagcagcaag agtccaccaa ctgaaatgt
18181 aggtgacagc tgtgctataa acctggccta ccagagacag gtatcgttga agctctgct
18241 gaattgtccat ttgatacaat cgggtctcgt tatctctag Rgtctctgg aattggcct
18301 tcaatgtgaga caaagatgct gaacttaag cctcctgtaa ccaattgatg taattgggta
18361 ttttggttgc ctgtaggctt tccagataga ctgcaactgt ggctttggt tctctaaaa
18421 acagttttta tgcttcagct ttttgggta tctccagagc ctgaatttca ccaattgtta
18481 tctgagtcac ctacgggatt ttgtcattgg ttcatctac aaactgtgtg taactaaatg
18541 actttaaatt ctttatcaac atgtcaagg atttgttaac atcttcaatg aatgttttaa
18601 aagataatcc attaatgttc tSacagcat catcaataaa tccaacaaat tcttcaaatg
18661 aatcttttat cttaacttgt tgtaggacat tgccttagtc tcttcaact tcttcaact
18721 tgtattgtgt ggccaactct actaatttat ccatataaac ctgattttgt tggcttact
18781 catacctctc gatlaactca tggacttttg ccttgaagc atgtattttc tgactactt
18841 caaaatcccc aataagattt atacaagaat gtttgacatg ctcaagaaat tctttttatc
18901 tttcaaatga aatttgtatt cccaattgat ccaattgatg atttctgtat atagctctaa
18961 tgtgttgttt taactttcca gctaggtgct gattttgga tttctgtatc agctttttga
19021 gctgctgcag tttttctgt actcgtgatc tgaattttgt tcatattc aacttttgaa
19081 tccagagatc agtactactt ccaattttgt taaaatcaat attttcaata acaaatgtta
19141 gatcatgga ttgttttact aaattttacac ggaatgata gtgctcatca agctttttga
19201 atttttcaat gatttcatca ataatttag caatatgtat tttcaaatca tgtaaatcat
19261 aactatcttt aatatactga tcaaatttga tcatatagt ctgcagattga gatagtttt
19321 cattaaaagt gattttggca tcaatctaat caattttgat atcatttctt gtaattctat
19381 actttttgt gagagcagtc agttttctct tggcagatga acctgtctc tcccaatgt
19441 atgaattcag ataactatta gcttgcgtgc ggagttttcc caggctgctg ctgtatttcc
19501 ttaacaattg atcaaatattg atgtgcttca ggtttctctc ggtttttcc agtcaacta

19561 taatgggtttg tcgattccctc tcaaaatatt cttgcaagggt ctcaaaaaatt gggaggttatt
 19621 tggagtggaac atttctgggtt ttatcatact ttacaaaagc aacaatttgta aattcttggg
 19681 gcttctcaac ggcattctctc atctctaaag catcaatgat attgatgggc tcaactgagta
 19741 aaagtggagc ttaatttggg gagtctagta gagttaggtc aggcagagatt gcttcagagta
 19801 gctccacgcc aatttttatct ttatgtttgt aagactccaa gctctggcgt tatctattgt
 19861 tgttaaaatt ggtcttgagt ttccaggtgc ctgtctgctc agctggagta acgagggcac
 19921 tgacttttgt ttcaagagct gcaactgatgc ttttctcaga cacagagatga tgactttgtg
 19981 agccttttga atcatgagag aaagtaaatg ccagaggttc tggcttcaac aggaatttgc
 20041 tatcacagtg cccagtatgt tctcccaga gaggcaggtt cccattgcc aattgtatgt
 20101 catgactgtg catggtaaac gggggccatt acaaacggaa gcacatgtgc ttatgcagtg
 20161 agtctgaatt atagtttgtg ctcatgtcaa tggctgaagc cagccacagc atgtctgtgt
 20221 tgagccgatg gctaaactcc acaccctgaa ccttagcaac agtctctgct ttatagcttg
 20281 ctgataaagg agcagaagag atggcataga tgtgttttat ttcatatttt tggtaggctc
 20341 ctttttaggtt accagccaca tgcagcttca ggggttctag ccgtagtttc cattttgttg
 20401 tgagatccag agcatttgtat ttccagttac tgtttaaagt agttaccaga gaattagggct
 20461 gtactgtgaa attaacagtt tgcctataaa acttgtcaga gctgtaaatg tgtcaagtt
 20521 ttgaagacaa gtccagtgat aagcctgcaa tgttcagact gtttgtgtgg tcaaatttca
 20581 tttcagata tgagcccatc atgtcatttg agagcttaag tctctttgta ctgaccttga
 20641 agttgaaatt gtttttgcgt tcgacaccca gaatcatggc ctgtataagca tcttccagtg
 20701 atagctctgt gaggcggtct ttcccatcca gactgaattt tgcattgtgt cctctgaagc
 20761 ggcattattgt tgttaatttc atagatgccc cagagagggc aaagctctca ttccagctat
 20821 tctccagcac caggagacta cacttcaagt tggctgtgac actgtgtatc atttccattt
 20881 ggccaactct tagtgtcgc ttgtgagcac cactattaat tttgtcagtg cctaaagatg
 20941 cagcatttca ctcaagacca tgggaattta gtgaccaga aagcaggggt aagaaacctca
 21001 atgactcgtat atcagcctga tatcagaag gcagcagtg acttttgcctt gagaaggtca
 21061 tatccattct gttagaagt gcaaaagtct tctatctccc tatcttctga caattttaaag
 21121 tcagctcgtat gttctcctac tttagggaag cagttatttt aatgatgcc aatttgcagat
 21181 cagaggtcga ggtgagggag agggttccat ctctcatctc tctgtttatc tggttgtgct
 21241 cttggagctga ggagaggtta aacctcaggt tggactctcc attgagccgg ccagtggttag
 21301 gatccctctg acaagacagg ccatatgtgc ctttagcata gaacgaaag actctgaaact
 21361 gccatcaaat cttgacttct ttgacaacca aatgtctgtt ctttttggag tccaaatgaa
 21421 ctgaagcaga catctgtgtt cccaggaaac tagatgcate gaattattgt taactaaatt
 21481 agactgtggtt gtttccaaagt ttttctacat gactgaatt gatattcgaa tctagaaatt
 21541 tgtggcgtag agaccatca Yatgatagtg tgaacgtatt tctgtgtgca cttagttgtt
 21601 ctccagatcc taacataaaa atgaaaagac attggttaaa ttaagcagta catttccaga
 21661 gcaattctcta tgttgaaagt ctttcaataa taaagcccca tttttctggg caaattgtgc
 21721 aatgactccc tccatctgta atgcaaaagt aaaaictgat agcaaaaggc attcctccag
 21781 gaagcctctg ctgaccacca caggctttgt ttagggtccc ttgttgatgt ctctccactg
 21841 accttatact tatatactac actttatcat agcacctctc acactgaatt ataattgctg
 21901 gcttatactg ctactttctg ttactgccta ctagaattat taatacacgt gatattgtta
 21961 ataaattatt ctattttgtt aataaaataa aagacttcca agtagcaagg aagattatct
 22021 gctagaaagc caaagtcctt tctctcctgg aggaggtctc cctcttagag cctccagta
 22081 actagcccggt tgcacccctt acctgagcat agctcacctt gcaacttgta ggaaagcagg
 22141 tcaaccacag agctcagcct catgtgtgta cgagcccgaa ggtcgaaatg ctctgtgctg
 22201 tgtttgccac cactgtagga ggcggaccag ttgtacaagt tgcgttagac attcgtggag
 22261 aggtctagaa caccaggag aggcacttgc agttgtatac agttggaaat ggttaaaatt
 22321 gggacttgga actctcgaga tggcagatgg aatccacacag acttgaagtg agggcgtggt
 22381 gctctaacag tctctaacat ctttagatct ctggaggatt tgcacaccaa aggcaaaagg
 22441 atctcaattt tcaaaactgt cttgttcaag gtatatgtga cccggccatc gctgaaatgt
 22501 acaacaaaaga taacatcccc acagtcagac atcagctatt caaagtcttc gctctgtgac
 22561 cttcacacaa atattgtact tgcoccatc ccaaaagcac tctgcaattt tctttgtgct
 22621 acctcatctg ctgagaccct ttgctttac ctccactgt caaacactca atattttgt
 22681 aagctctctc aagggccact ccttatcatt acctatccac ctaagtcaat taattttgt
 22741 ctcaattctt cagttacata gtcccttgca cctttctcaa agagactgtc taattttgtg
 22801 ttatataatt aattatttct cattttgtga tgtctccatg gtactctctt gaagaaaagg
 22861 gctataacct acccagtttc tatcttctca ctgtacctag tctagctttt ggcacatagg
 22921 ggatactgta tacaattttg ctaaactgaa ttgagacaac ttgtattgtg gaagaaacat
 22981 aggtatggaa tgcagtaagc ctgggtttaa gatttttctc agaatgtgct ctttactgag
 23041 tgcctaatgg ctgtttctgac tctctctagc tttaacagcaa gctctgtagc atatacgcw
 23101 ctgccaattc tgaattcttc acagtacag aggaattttg ccttataacag ttgtgtactga
 23161 ataaaataat ttggggtgaa agtaccagaa tctcttaagt acttctctag attctctctg
 23221 acagggttg tgttctcatg ttaactaatg caaagatgct acaggttttg tctctatgtt
 23281 ataatctctc ttaaaatgct taaattattt cctttaaava tttaaaaaaa tgtctaaact
 23341 atgctatga aactcttcta ttaactttgc atgggtccag aagcctgtct gctttctctt

23401 tttaccctttt taagaagagg ttttctggga tgtggaagtc tggccaatccc atgttctgtga
23461 ggttgaaactc cttcaggcta ttgaggtggc cttgcgaagt cttgcgaagt gaagaactcc
23521 cagatgcctct ctgaagccat gagctcattg cctacaaatc gagcaggagat ttttaagtta
23581 atgggcttgg atgagcctca aagagcaatg aacattagge aaaaataccc atttgcaag
23641 ttaattatata agctggacaa tgcactgaaa gtttaaaaaa aataacagaa aattatgaat
23701 cttcgtttgac agtcactgat caetgtccat atttataaaa ggaatgtcta accatgtcag
23761 cctcctagct ggtgtcctga agcttctctt gataccacta ggcgaagaaa tgttctactt
23821 agtagactct ctttgataag tatcaacttc agcttttgtt tatcgagtaa ctcacacact
23881 gtgaaggttt tttttctccc ccaagaattc cttgggggga aggaagcatc ctttatcat
23941 ctttgaaac cttcctgcac ctactgcaag gttgagatg taattagcac tatataccat
24001 gtattttatg actgacagac tcatactaac aactattaat ttggaaccca cgtgcggaaa
24061 agtcatgtct gtttgagaga ctcgtgac caggagctta ttgacataca tatgaagct
24121 cttaggataa tcggagagat ccacagggaa atttggaagt atttttttgg tatctactt
24181 ggtgcctgtg ttccattcaa attcaatctt cttctcatc gaaaatacgt aggaatacgt
24241 tgtgaatggt actgattcag cctgtaacca caggttctaa caccctgatt accttggag
24301 tgctcacaca ggggaagaga cacataccat aatgccatgc caccctcttg gaaacttgg
24361 agccataagc tgtagcagat gactccattt ggagaagcag tttggcagcg qaccactggg
24421 cgaggatctc attctgggct tctgcttgca aacggggtat ggaataaaca ccttgattt
24481 tctttctctc ctttgtgtca caactatggt aagaataatc agttggcacc aatagtttt
24541 tccitttcaat gngatagtc aggattaaac agaagtctca cagaggtgga caaaacagg
24601 atacaaggat ggttcagaga aacagccaca gatcaaaact atcaactctt aaagccaaca
24661 ttcagacaaa attaaggact ttgcaaacag gtttaggaga aaagaagaatt ttttgaaaac
24721 tgtttgaatc ctgctctgct atttactagc tctgtgatt ttgaccaaat attttaaacc
24781 cttgagctac catttcccta tccatgaaac aggaaaaact acagtgaact cgcagtttat
24841 tgtgaggacc gagataattt ctttaaagca cccagcactg tcgtgtgata atgaatgagt
24901 agtgccctgat aatggttagg aaaaaccaac ttgacatgag ttgacatgga aatgttgag
24961 agctttggcgg ggtgcagtg ctYacacctg taatccagc actttgggag cccaagcgat
25021 gtggatcacg aggtcaggag atcgagacca tctgtgtcaa tctgttgaaa ccttgctctc
25081 actaaaaataa taaaaattag ctgggtgtgg tggtcatgac ctatagttcc agtctcttgg
25141 gaggcttaag caggagaatc acttgaaact gggagcggga ggttgagctg agccagagtt
25201 gtgccactgc actccagcct ggtgacagag tgagactcca tctcaaaaaa aaaaaaatt
25261 gttgagggct cctcttgcca cttgatgtt agactagggg agaacatggc ttggtcaggt
25321 atgaagtggga agaggaataa tgaaaaagac caccagggcc tgcagtgcag gtcatagtag
25381 cctgcgcttt ctttacccta ggtggccat gaggggcacc tgcaattttt tcttgtctt
25441 aatgtccagg gtgagttctg aagacgtttt gccctcagta gatctcatat taactctag
25501 gattgttccg aggtcaacat caaaaaccgg aatttgact tctctggaca aggtcactg
25561 ctgcccatta tatttgaatg tcatgttagc ctcagttctg tctgcacctg gacgagtgt
25621 taagagaatc aagagatgtg tggtaagaa cttatgtttg ggcgcgggtg ggtggctcac
25681 acctgtaatc ccagcacttt ggaagccaaa ggcggggcaga tcatgaggtc aggaagatca
25741 gaccattctg gctaacatgg tgaacccccg tctctactaa aatacaaaa aattaqccg
25801 gcgcgttgtt ggtgctctgt agtccagct actcaggagg ctgaggcagg agaatggcat
25861 gaacccggga ggcgggctt gcaagtgcac gagatggcac cactgcactg gacgctggag
25921 aaaaagcaga gactccatct caaaaaataa ataaataaat aataacaaac
25981 aataaataa ataaataaat aaagaagcta tgtttggaa ggaagaagag gaaaagggtc
26041 agaaactcca aggaatcaat gtgcttaaac aaaaacacag ttcaggattt tactgaatt
26101 ttttttcttc attaaaaatt tttaatgggt cttatttact gataattttt aactcagttg
26161 tgttcatgta tgcaagtctt tatggatgac ctgttatgag cctattgttg gctgggcact
26221 gctctgtgta ctggggaatc cttgctttca agatggtaat tctctagtgg gtaggtgtg
26281 caggcaataa acaagtaact tgctcatgac agaaagagtg tttattcata ctgtgtgtc
26401 aaactggata caaggataaa agaaagggat gggcagagac gagaatgaaa agaggttga
26461 agagaatct tctctgataa gggcagatg gggcagagac gtcaggaaat gaaaaggctc
26521 gccacgctga gttctggag gaqacacatc tggttgtgga acagcaaagt cctcgagccc
26581 ggaagacacg acatctctat attactttct acccaaactc cctctctctt tctctgtg
26641 ccttgcctct gggctccatc tcccaactc atcctctgta aaacaagtat ttccggcg
26701 tcccttaact cataggctgg tccattttat atcctctgta atccagattt taccacagc
26761 taatttccca gcgtgccctg ctctccagt gctttctatc atgggaattt ctctcagtt
26821 taatttctga atgctatc cctatataac aatttttcca aagtgaataa cttaaattat
26881 cccattccct aaaaactgct cctcgtatc cctataat ttttttcca aagtgaataa
26941 ctaaaattct cccattccct aaaaactgct cctcagtag cctcttccat ccttaataa
27001 ggaagtttca tttttcagtt gcccgggcca aaaaactggt tttgtctc atctccctt
27061 tctcttccca ctcaacatc actgtatcag caaatcttgt cagcctaact tccaanaat
27121 ggccagaatc catccctc tcatactctc tctgcattg cctcgatcca aaacaactc
27181 gatctctgc tggattattg tgataaccta catattagtt tctctgcctc

27241 tagctcttttc tcaacataaa cataaatcaa atcatgagga ctcctccaaat gcccttcgttt
27301 aattcatatga aaaagccaaa gttctttacca tggcctatga gatttatctct cttctcaccat
27361 tccatatactc tctgtccctca tcttctacct cttttctccc tggctctttct cctccagacca
27421 taactgtcttc cctccttttcc tgaacaatg gttagtagtg gtcagctcca gggcctttgc
27481 acttgctgtgt cctctgtgct gtaaacagtc ttaccacagc gttctctctc tatctctctgW
27541 taggtgtcctt tatgtcact ttaccaggga gactttccct tatatttoca aaatcactgc
27601 tttctcctgcc cttctctctc cctcctactc ctacgcctcc atagaccagt ctacgctctg
27661 ttttctcctc cagtacttat ctgattttcc aaatattaac ttgtttgttt gactcgtctg
27721 acttccctatga aggcagagac tccattgttc actgttctag cccagctctg tagaattaggc
27781 ctgcgcctga tgggttactc agttaaccoc ggtcttagaa tccaggtgcc gcttagttggg
27841 tactcagttta acctatttgt taaataggtt aaattacatg tcttctcctc atgaattctg
27901 aacctgagac tgcgagcaqa gatgagcgag cttgtgtttg aatactcacc ctctgcttga
27961 gttacaaact tcagggtatc caccagagct ctgtcctctc tctggagctc ataggtttgcg
28021 ctgacagaat agctctcaat cttcctgtga ggcctcagtt ccagctctaa ctctaaagaca
28081 ttacaatgaa gacagtgcat aatgttagag ctttcaagga tggtagattt gtctcccaaa
28141 caattcagtc tcaaatgcaa caaaaalatg tctcttattt taacattgtc tctgtccctt
28201 aactaagatg atctttttga tccctcagtc ctacaagaac ccaagggaag ggcagacacc
28261 aggattccca agactttgga caagcagagc aggaagtggc tggttgtttc agcaagagct
28321 agaacaaagca ctggaacttg ggggctgaag acaggagacc acctaaagtc ggtgaaggct
28381 tcaagcacat tgggtggctc cagggaagctc atagcgatgg gtctggaggg ctgaaaacat
28441 ggacactgaa tttagagcaa attgggagct gtgctgtgat cccatcccat ccaagaagaa
28501 gcaaaaaggtg acaccaatg tgttgccagc aggcacctgc ttttaaaacc caaagtggg
28561 gcaaacccagc aaggctagtg acagggtctt acaacacaga gttatttttc cttgtgccat
28621 ctgagtgccc atgatgtgga aggtgagaaa atgctgggtc aggcactgag ctctctaac
28681 ctggtgtctcc cgttcagcgg atagtaggag gcggagtctg tggagctggc gtgtggagtaa
28741 ggcctgagtg tgcagtaatt caggccagga aagacttgc tgcgaactga cttcgttga
28801 ctttctctcaa tgaagggtgg gatcacctcc cttttgggtg tagagaccaa atgttaatgtg
28861 ttgtctgtgaa agacaaaaaa tactctagtt attgccaagt catgatacaa aatggacatc
28921 accaaattctc aggggtcгаа taccctcta tctctctgtc tctcctcagt ccacacctat
28981 cttctaactat ttaatttact gagaacaaaa taattataga aagaacatga acatgcaag
29041 ccatgagatg gactctgaag cttctggctg agttctttcc atctgttacc tgttaatcccc
29101 acacagtagtg gcttatggtt ctcaatttacc agaagcagag cctcagagatg ttttaaatagc
29161 tgatcactgag ggtcgaactt cagtgtgccc cttcctctct acaatgcagg gcaagagaaa
29221 cttctctctt catatgaaat ctctactctc ctactgctt ccttccactg cttctaaagc
29281 cgtcgaagtc tcttcccttg tgcctctccc ctatgtctct tcttctctt cttgtcttcc
29341 tcatcttctc caccatcaag agttgtctgc ctttgcagtc tctacttctc cccaatgtgc
29401 tctgactgct cactccatct cctgaaaaatg ctttcatcaa tgtctctaat gccctcttg
29461 cttctacatc caatgggcat atttaggttt catcttctt gacctccagc aagccttcca
29521 tagagttgcg cactcatgac cagactaaga cgtggagccc tctcacatct gaagagatga
29581 tggcaccctc cttocaagtg tgaacttaaa aacttagtac atgtaagaaa gttcaacatt
29641 ggcctgggtt tttctaagga tgtttctctt gaaatagcac attttctcctc aagtatgtt
29701 tctccaagtg ggggtgcca caagaccaaag cttgtgtgat gttctgtgag ccttaatggc
29761 gcttctgcct acccatgggg tgatctcccc tgtggctgct ctttggctct tgtgaccttt
29821 tatggctttg gttctccttc gtctctctg tgcacttct ctaactcatt gctgttatt
29881 cccctctctc ctttatatgt ttgtctctc catatttctg tctcatctc tctatctcca
29941 cttataacca gttgctgttt aaccacaaca accctgtgat actaatgatt cccaatacca
30001 tatgtggagc ccaagcctct ttaactgggtc cagatccata ggtctatttg acagctagat
30061 tcttaaaagt gttgtttcat aggaagacat caatacacgc acatccaaaa ctaattttgt
30121 cacttctctt gaaccagaa gctctccacc tgtagtctt atftaaaatga agggcgctc
30181 cttctctctt tcttcttct tttgcttgat cccatacccc agttaaaccac aggcactca
30241 tgatctgtgcc tcttagaagc tttagaactc tgcctacccc tttctatacc tggctttct
30301 cactgcagcg ccaattatcg ctttagacca catagagatg taagagatgt ccaatggctc
30361 cttctgtgcc agctgtgctt ctttctcacc catctccac actagagtcga gagtattat
30421 tctaaaaact caccctatc ttaattctgc tcccttttc aactcctctg ctttcaaaaag
30481 agtccaaact ccttaggatg gctttcgagc ctgggagtcg tctctcccc cctcactct
30541 ccccatctc tctgagcccc ttacaltct gcactctctc cagttctctg accactatc
30601 ctttaccttc aggcattatc atgctttctc ttttgcctgg aacactcaet ctttctctc
30661 ttgccttaaa gactctgaca cagtcctcag ttatcagtaa aagtcacatt gcttcagaat
30721 gcatctcttg actagcacag gctacatgat ataaaaatc atgtgtactct aatatactt
30781 atcaatagc cctactcta tgattactgc ttgtcttaat gttgtctctc cttataaaa
30841 gtaagYgttc aaaggctcag gacttgtgt gtctcactca acatagctgg tataattag
30901 gcaattaaat atactattt ttgtttttg tgagacagga tctgtctctg tctccaggc
30961 tggagtgcag tgggtcaagc atggttcaet gaaggctga actcttgggc tcaagtgatc
31021 ctccccatc agcctctgga gtagctggag ctacagcatg gtcgccacc gactgtctaa

31081	ttttgttratt	tattttaattt	ttttttaga	gatgggggtt	tgcactgttg	cccagctgg
31141	tttccaaaac	ccagggtctca	agcgatccat	ccactcgggg	ctcccaaaat	gctagagatta
31201	caggcatgaa	ccaccgtgtgc	ggcccaatta	aatatttatt	trgaatgaac	acatgaagt
31261	gtctaaaaat	tgaaaactaa	ggcaaatcaa	tggttgaggy	tgccacttaa	aaatggaact
31321	tccaaaagag	gctgtattcc	attatcacga	ggtttagaggt	ttcatgcttt	acctactcaag
31381	ctacctcaaa	tcaaatatgtt	cttaggtatt	ttttKggggg	gaaaattatta	attttccaaa
31441	gatgatctct	ccRgagctat	tggtttctca	ttctcaaaac	aaatagatata	caaaaataaa
31501	caactttaat	aaaactaatt	aagcagtagg	tcttaataag	tctcaagca	gaagaatata
31561	ggagcattta	gtaaaaatgtg	aaaagttagaa	gaaagttaat	tatgtagtta	tgttagtaagt
31621	ctgaggtctga	attaaaaatag	gtaacccgga	atctttccct	tctactcttc	tcctgtcttc
31681	tcaggagctgc	aatgatctca	atcaactgtt	tagcctggca	aaattctgca	gggtacattct
31741	ctgtttctct	tttcaaacgt	gctagggcga	cttggctgaa	agaattacc	tcactgagc
31801	agcttgactgc	gtctctttgg	ggaaggaaat	ataaaactca	gcttccagca	ttttagggca
31861	acatgagctc	ccagaccgga	ctcgtggaa	aaagtggtrt	tcactggac	cccatctcca
31921	gcgaagtccg	gaatgatgat	gcccatattt	gtcacaact	ccacagacac	ggaggggtttt
31981	gccacagtt	cagcctgcat	ctataagtca	gaaaaaac	tattcagat	ctataaatac
32041	ttcagtcctc	gttcagtcag	atcaaacacc	ctttctcacc	tcggggcaaa	gatttctctg
32101	ataactctca	cttttgaa	cattactggg	attgttttg	aaagaagaaa	gcaggtttctc
32161	agtttctcag	agttggagta	tactaccag	aaactagaag	ccactgagtt	aaactgaggg
32221	aaaacccatg	taaaagatg	ataggaatac	tcaattgttg	agagaactga	gtctctgttc
32281	tatggccata	ccactactgg	agctagttag	gtagtgcatt	ctgggtgaa	ctrgaagttt
32341	ttcataaaaa	ataaatgagg	tgattacaat	gatgaagcat	tttgtcttga	atggaataca
32401	cattttttaa	tatgttttaa	caagaatgc	accctggaa	aaagtataaa	cctaagaata
32461	caaaaaggcaa	acagaaatctt	acgttggtca	cttccagttt	tactccagct	tgctctccgg
32521	gagcaargac	tcagatgaa	gataattgca	actgtaacct	agcctccagtt	ggggagtcca
32581	agggactctc	caagaagatg	tagtgaagaa	aaaagtcat	ctttgagccc	ttctctgata
32641	ctctctcaat	ctgtagacc	aaacaaggag	agcaataaaa	agtaagcttt	tttaaggttg
32701	gttttttttaa	ttacaacctc	ccatcacattg	gagagttaatt	ctcttttatt	cggaagacaa
32761	ggagctagcat	attttgatga	gctgaatagt	ttgataaata	aaagatcaaa	tgatgttttt
32821	accgttttca	gtgaatcagg	atataagaaa	tttcaactaga	tatgatacat	gactttttca
32881	agtgagctca	gaaggtctct	aagaatattg	ctgggctcca	gagcttttagt	gaacttttaagt
32941	atcatatctg	ccatggctta	attctgtgtg	ctgtgagctc	gactgttaagt	gagaggtgtac
33001	ttgaaatgtc	ttatatattg	ataaaatcaa	ttttttgaaa	ccaaaggcct	attagagatga
33061	tgtcacatga	aaattgcat	gggttttatt	ttttaataaa	tatttcaata	taagactgtg
33121	agacctgttt	tcttaaaagt	aaacattttt	taatcaagcc	ataggagtac	atttatata
33181	ttcctttttat	gaattataaa	taaaaattat	agcatattta	gatagtgaat	tatagtttgc
33241	caataactct	cttttataat	cattgtatca	tttcaactct	aaaaggacct	tcaggttcagg
33301	tgacgtggct	cacacctgtt	attccagcac	tgtgggaggg	ccaggctgga	ggatcacttg
33361	aggtcaggag	ttcgaacca	gcctgacatg	gttgtcaaca	ggctgtcttc	tactaaagat
33421	acacaaatta	gcggggcatg	ctggtgcacg	tcacagctcc	cagctacttg	ggaggtctgag
33481	cgaggagaat	tgcttgaacc	cggaaggcag	agttgcagtg	agccgagatt	gtatcactgc
33541	actccagcct	gggagcaaga	ctccatctca	aaaaaattaaa	aaaaataaaa	gaactataaaa
33601	agggacttca	gcaaaagtag	aggaaggtat	accgaacatt	gttttccaga	tgaataattc
33661	aaegtcttca	aaaaacacgc	taacattatg	aatagcttaa	ttcttaaatg	ttaacatttc
33721	catgtgaccc	aagagtcac	ttcagtgaaa	ttcaaggcaa	acctccatct	ctgaagaaag
33781	tcaagagctc	ttttcgggct	tgtgcagctg	ggagtctgaag	ggagctctgg	ccaggtctgg
33841	aaaaaaccaa	gtctggtctc	atgggcccc	agtgggccct	gctgacttac	cactctgggg
33901	atccccctga	gagtcggggc	accatcaga	agcagcttcc	ccagagctg	gagcagttg
33961	agactggcaa	aaccaagctc	ctctcccaag	atgcggaggt	agggctctgg	ttccgggact
34021	cttttggatt	tcaaatcttt	aatcagcttc	tcaacactga	gattatttcc	atttaccata
34081	tcctgagagt	ttagtataaa	aatggccaat	gagatgtcag	caatgtcaaa	accctttcag
34141	ttcccaatgt	gggacctgtc	tgatgcagcc	aggaatggcc	taaaaaatgc	tccaggttgc
34201	gaacaggagg	acactgaagt	ccaggctaat	ttctctaagc	agagattaaa	gaactaaggt
34261	cttgtcaggg	atagtggcac	tcttaaaagt	atttctaatt	aaaaaatctg	tagacatatt
34321	aaagtgtggt	gggatgagag	gaggggtccc	tattctccag	tatgccaggt	tccccaagat
34381	tgaagaatcc	tctatcccc	accggttccc	tgcttatgct	tctcttcttt	gaccagtgaa
34441	gactacaagg	tgtttcttaa	gaaaatgtag	ctgttatata	aatccaccag	aagtttgaaa
34501	aacacttgat	cctagacaa	ttcttctcag	agagaagaag	atccactcag	atggatgcc
34561	agggcatggg	aaaaaaaaaa	tgtgaaactg	acagactcaa	acagactcaa	agatctctgg
34621	ctccaaagtg	gggtcaggaa	attagaagat	ggagctctg	ctcaagctg	agcctggagg
34681	ggtaaatatt	tgcttctctc	tgcaaaagt	aatgtgcata	caagtcaact	gaggtctctc
34741	taaaaatgcg	tcttgattca	tgagatttgg	ggatgaagcat	gagaagcgtg	atttctgagg
34801	agggacacat	ttgggtagca	aaaaattcaa	gaataagctc	cagatcatac	aacctatttc
34861	ctctctttaa	tgggggtcca	tgtcagctt	caaaagtggaa	gtttgagctc	atttgcaggt

34921	gcactgataa	gagtgagagc	caaaagacagc	agtttaataat	aatgaaaaata	tttaattttaga
34981	atcgtgtatg	gtgtctgtctt	atggaacaac	caatgccagc	atacggcagt	gtgtgttgga
35041	tttttagatg	cttatttctat	tgctctttaa	taaccttctg	aaagttttagc	tgattatgag
35101	atctgtggat	acagacagaa	acagatatac	ataataca	caactctccc	caagtgcga
35161	caagcttcaag	acagggaagt	taqaattaaa	tctatgccca	gaagtcacat	tttttttttt
35221	tttaagatac	agctccacac	tgctaccocg	gtgtgagtg	aacggctctga	ctctggctga
35281	ctgcaacctc	cacctcccg	gttcaagcaa	ttctcclgtc	tcagcctccc	gaglagctag
35341	gattacagc	accactacc	atgccacgt	agtttttttg	tatttttttg	agagacagga
35401	ttttagatgt	ttggccagcg	tggtctcaaa	ttctcgacct	tggtatctgc	ccaccttgcc
35461	ctcccaagc	gtggggatta	caggcatgaa	ccaccacac	cgcccgagc	ttcatctct
35521	tgttatctta	gaglaactat	tgtagtgctg	gtttctgggc	acactgaatt	caggagatct
35581	tttaactgag	agdatactgg	cccttaccoc	agcaggtctg	gttgataaaa	accatagtta
35641	tcctctcagt	tagatagtal	tttgaggact	tcctagtcta	gaaaagaatt	gtttttgcat
35701	tgagacccaa	agcttttctt	aagaagatac	ttcacaata	caactcgtc	catgttttat
35761	atcttttgta	tagccaaagi	ggctccactaa	gaccttagag	acacactcag	gttctgtacc
35821	atataccag	tacaaagctt	tgtagacact	gtctgggaaa	taactcctgt	gccccaaaag
35881	agcttccaat	gttggtctcaa	agccttttcc	ttccaagcca	atctgagaaa	gaaatcaga
35941	caagaaaagt	gcatcaggtt	tcctttgtgt	atgccagct	actgtctccc	ccctctgatg
36001	tcattttatc	taaacaaagt	tttgaatacc	acaggccagg	agctcagctt	agcattttcac
36061	aggagctgct	ttattaaaat	ctcactagaa	tcctgacctt	ataactgtct	tttttctaga
36121	agaggcagct	aaagtttcaga	taggacaaat	aattcaacaa	aggatcagca	gttgggagtg
36181	atlttgagatt	tgaagcagat	ctgactaggc	agcacatatg	cttctctggc	tttgggaact
36241	aaagacagca	cattttgcatt	tcaatttttt	tttttttttt	tttttttttg	atggagctct
36301	gctctgtccg	ccaggctgga	gcgcagtggc	gcaactctct	gtgtcactgc	acactgtccc
36361	tccttggtgt	acgccattct	ccctgcctcat	ccctcccaagt	agctgggact	acagggtctc
36421	gccacacagc	ccggctaatt	ttttgtattt	tttagtagaga	ttggctttca	ccgtgttagc
36481	caggatgggt	tgatatactt	gacctcatga	ttccaccgac	tcggccctccc	aaagtgtctg
36541	gattacagca	gtgagccacc	tcgccaggcc	tgacttttca	ttaagtgtaa	gaagtcacg
36601	ttcaggtgac	ccctagcggg	gagagaggaa	ggcgggggag	gagggaaaag	agaaagcctc
36661	agaatcatg	taggaagtgc	ctgggtgttc	ttagtttttc	tcctggtagc	tcctgtcttc
36721	cagggaactct	ctgttttatga	tgctgtacaa	aatgggctag	agaaacctcaa	actctctaca
36781	cttaacctgc	tgaagctcag	tgaagcaaat	ccaaaggcag	tggaggttag	tttccagact
36841	ctttctttag	gaaggttagtt	attttgatca	aatataagat	tcctcttcat	tttggctgag
36901	gctgggtcaa	gtgatggaa	agaaacagat	ttgtagagtt	gatagttccg	agagaatttt
36961	ctgaagtcca	tgacagttgg	aagttgagat	tccttcagaa	cttctctcac	taactttttc
37021	agactagata	agaagaagta	tattttgagc	tgacacacca	tggttatatc	ctttgactct
37081	tgacacccaa	gtaaatatgg	atttccaact	actacccaaa	tgctcttgatt	tcattgaccc
37141	taagtctttg	ggctagatc	tgctacacat	ttgcacaaat	gtttgtttca	gaagcaaggg
37201	cagacagtg	ctatgccaaa	acctaggggt	ggaattccag	ctcaggggccc	tcagttgtag
37261	atgggggtgaa	tagctctttac	ttactcttgg	atatccaatt	cttctgagtt	caagattatg
37321	gcaatattggg	aagccacaaa	gttcttcaat	tgctcattct	gttcccatgt	tggaattttg
37381	acaattttgt	taatactcgc	ctgtgaagga	ctctcatca	acataagata	tgcagctgag
37441	cgctttatctc	ccggagaagc	atcatcaagg	aaagtctgaa	gaagaaccctc	ctggtctctgc
37501	agtcacaaag	ggagalggtt	atcaactgtc	tggtgtcaga	acacagacaa	tgctgtgagc
37561	acactggcat	tgctgtgcat	ctctttctta	agcacagctc	taattttctc	gtaactgttc
37621	ttcaaatgct	gggatlgatt	cttcttgcca	gtgttttcta	gagcactatc	gttttaagct
37681	tcccaagaaa	agcctgtgga	atgcctgttg	aattcaattc	catataaaaca	cataaattat
37741	ggccaagtgt	tgattttggt	ggagatccac	caataagttc	atcatcaatt	gttttaagct
37801	aagtttatttt	aatgtgagga	taaaagatgag	aaagggtagt	aaagattttg	ggctaataaa
37861	tagggtagtg	tccaaagtct	tgaggtcttt	gcaactaaga	gggggccaa	ttgtctatcc
37921	tagcctaagc	ttattggggg	aaaataaagc	atgtttttct	atcatgagag	ggatgtgtca
37981	ctgtgtagtg	ggacgglagg	aagcaaaaac	atctcagctg	ctgcatgttg	acatgagcga
38041	aaagtcaagt	atttctctca	cgctcacatc	tgctaggcag	tcagagtcaat	aggtctgttg
38101	aaatttgcaa	ttagaaaaca	gtagaggcca	ggtgcagtg	ctcagcgtct	taatccagc
38161	acttttgcaa	gctgagcgag	gcggatcacc	tgaggtcagg	agctcaagac	caagctggcc
38221	acaatggcaa	aactccatct	ctactaaaaa	atacaaaaaa	tagctgtgtg	taagtgccca
38281	tgctctgtaat	cccagtttact	caggaggctg	aggcagagag	aatgtctctga	accaggaggg
38341	caagaagtgc	agtgagccga	gatcatgccca	ctgactccca	gccgtggcaa	tagagtgaga
38401	ttccatctcg	aaagaaggaa	ggaaggagag	aaagaagaaa	gggagggag	gaggaagaaa
38461	ggaaggaagc	aaagaaggaa	aggaagagaa	cagcagaata	aagtcagtag	atgaaattca
38521	gagtcctcat	cccttagtat	cttccaaatc	cttgttaata	aaactttcact	ttcagacctc
38581	ttctgttgga	ctttactctg	tccttaggct	ccattttctg	cagacgctgt	tttgagactt
38641	tcctgagcat	cagtgatgac	tttgtacttt	ggacacattt	Saggaatgaa	gacttgagtt
38701	ctggagttaa	ctgctccatg	gtttggccca	tatttccaat	gcacctgatt	gaagaaaaga

38761 aacaagaacc catcagggtg caggagaggg aagtaaaagg gtgtccaggaa aagtgtctct
38821 gaattgatgt atgtcatata aaagacttag attaccgcga ggtgtaatct
38881 tcatccccag tgcagtcatt ttgaactctg tccatcaggt aatagacaaat ggtcagcagg
38941 cctctgggtc ctgtagggtt tgtcttatga tagctacaga ataagagaag agagtgcagg
39001 cttgtggacc ccagtttagt ttgtcttaaa acccaaaact gtgaatttga aaaaataatt
39061 ataaaattca tatggaatcc aaaaagagcc tgaatagctg aagcaatttt agcgaaaagg
39121 aacatagctg gaggcacacc attacctgac ttccagattat acacagaggc tatagtaatc
39181 taacacagat tgcactggca taataataga cacatagatc attggaacag aatactgaac
39241 ccagaaaata agtcacatcac ttacagtcaa cggatctttg acaaaYtga caaaaacata
39301 cactagagaa aggcacacct tttaataag ttgtgtcggt aaagatggat tgcacatagc
39361 agaagaataa aactggagctc ctatctgtca ccatataaaa aaatcaactc aagatggatc
39421 aaagacttaa atataagacc tgagactata aaaaatgcaag aagaaaacct agggaaaact
39481 tctctggaga ttggcctaga caaagaattc gtgaataaga cctcaaaagg caagacaaca
39541 aaaaacaaaa atagacaaat agaacttaat taagtaaaa agtttctgca cagtataaca
39601 aataatcaac aggggtgttaa cctgcagaat gggagaaaat atttgcacac tatctatcca
39661 atgggtgtact aatatccgga atgtacaagc aattcaaaaa actcaacaaa aaaaatcccc
39721 aataaatccc attaaaaagt aggcacaggga catgaataga catttttttc aaaaagaagc
39781 atacaaatgt caatagccat atgaaaaaat gcataacatt actaatcatt agagaatagt
39841 aaaaataaac cacaatgaga taacatttta caagagtcag gaggggccatt attcaaaaga
39901 caaaataaaa cagttgttgg tgaggataca gagaaaaaga aacagat taat cactgtgtg
39961 gggattgtaa ataagtacaa ccactatgga aaaaacataca gagattttctc aagaacataa
40021 aataagacact accaataaat ccaacaatcc cattactggg tatataccta aaggaaaagg
40081 aatcattata tccaaaaggaa acctgcaccc atattgttat cacagcacta ttcacataag
40141 caaagacatg gaatcaacct aagttcttat caatggacga ttggattaaa attcgtaat
40201 gtataggtaa taaaatacta ttgcggcata aaaaagaata aatcatgtca tttgcagcaa
40261 catcagtgga actggaggctc attgtcttaa gtgaacacag acagtccacag aagacaacaa
40321 attgcgtgtt gtcatttata agtgggagtg aataatagt cacaacagga catagtgtgt
40381 ggaatgata caaattgaga ctacagaagt gtggaagtgg agggagatgg attgtgaga
40441 attacttagt gggtagacta tatgttgtct ggtgtatgga taccctgaaa cccctgactt
40501 aactactgca caatctattc atgtaacaaa attacactgt ttccacataa atttatataa
40561 aaaaatgaaa aagaaaaagc caaaaaattt catcaaaaga aaaaactgct agcctgagca
40621 accgtgtgta accctgtatc taccagaagt acaaaaatta gccagggcat gtagtagcat
40681 accgtgtgct ccagctactc agggaggctga ggtgggagga tcaactcagc cagggaattt
40741 gaggtctcag tgagccgtga ctgcactcac gcactccagc ctgggtgaca catgagacc
40801 attccaaaaa acaacacaaca acaaaaaaaa acaaaacaaa caaacaaaaa aattcagagg
40861 aaaaaactgc taactaatat tgaactgaag ttaataatat gaaagctgtg atacttaggg
40921 gaaagtgtgt tgatgtttgc aatttacttt gaaatgcttc agaaaataag atgaatatt
40981 ggatggatgt atatgtgata aagcaaatat aataacactt aaatagtagg agatagctgt
41041 ttttctaggg gttttccctg tgaattcttg tcaactttgc tatgttcaaa aactttata
41101 atataatgta gagaaaaat ttttaaaaat tcaattttgt ttgtgtgatt tcttatttca
41161 agtcattacc ccaaaaaatga tcaagaaaaa acacagaagt aaggagcaga ttgtgaaagt
41221 ggaaggaggg gttcagtttt aatcacagaga tgcacagagg tcaagatgtt cttctgtctc
41281 ctaggaggag aaatacagtg tggaactca ctgtgtgacc gcgtggctca gcgcatacaa
41341 ggtggtctcg ctgcgctgat cctcgccact gttgaagatc gtggaagtgc cgtgactaga
41401 gggctcgagg atcagggccca ccaggttaggt gaccacatct atcagaaggg ggtgtgcatg
41461 caacagtttc agccactgga ggaatgtgag ggagcactga gctgtccac actgaaccaa
41521 ggcttgtaaa gtgatggggc tgagaagaaa gacatggata aagttataca gaccaccttc
41581 agggcacata aatatgtgtc catgtgtgtg cctctgccag gagagccctt aatcacctca
41641 ttactatttc aaatctaact tcaaaaacca acttggagct cagaacatgt atgctttctc
41701 taggaatat acccacagaa gaagcccaat cgagaaaagt tccaagagg gactgttgat
41761 ctgtagcaac aagaagactg ttatcacagt cctttggcca gcacacagaa tatgcctgtc
41821 caacattagc ttggtctcat tctctggcctc agtccctct ctccacttca tagcattaa
41881 agccagctgc ttgaagggtg gagaatatat attatatatt tctgtctagt tctcttcca
41941 cagccctata agcttctgga gagcacctgc aatagacctt gaaatataa gtaaccactc
42001 aaaaatgggg aactattctc ctctgtttt aaacacaaa tcatagctgt ccttgaacac
42061 ageltgcggg ttgtgttttc atggaactca gcgcagcagc tgatagttct ctccacga
42121 atcatgaact gattgactaa ttgattact ggattgatat ccaaatggtc cctgagatgc
42181 tctattggc caaggtttga aagttcagtc agttaccatc agttttataa aagttgtatc
42241 tgtaaccatt agataactcg acacctcaat cagctgtggc aagagagatg tgcgtctc
42301 atcactgagg cctctcagct cagttaacag ctatttagag agatagctc atgtgatat
42361 ttgtctcag aggtttagtt tttttagtct cgtggagctc ttcaaacagc ctctggcctg
42421 ctttggaggt gatgtggatt ttgtgctctc aaatgcagg cccatctctc tagtactctg
42481 aagatggaaa gtgtcaagg aactctagct ttcttcatct caaccatate tttgtctact
42541 ggaagctgga aattgtggag tatcagcaca ggggaaaaag gaagaaaact atctctgatt

42601 caatgectgc tagatctggc tctgccatag gtgattgact tgttttctact ctactcatcat
 42661 cctatccctg ttgggtggga tttattgttca atttaatgat aaattcaagcc ctgcttctga
 42721 gacccacaga gtttttgggc catgtaaaat gctcatccct ggaatctcagc gatgactccc
 42781 aagatgagga caaagagatg agaccacagag atgaggaagt gtgaccacga catgaqacaa
 42841 ttaagtttctc caaagactct cagggtctaa gaggtgagac taaagtggaa tccagactctg
 42901 tctgaqtcta tcatcaggtt acccttaget tgaataaatt ggtgaggaggt Wctactctgt
 42961 gacatgggta caactgggac caggacatag ggtgcttacc accatttctt ctaatttgggt
 43021 ctaccagcag ctgtgggga ggggagacac ttttgtatcc tctccaccac ctactgttga
 43081 ctatggccag aagagaggtta aaagtcatca tggaaatgtg gtgtaatgag aaatgctctg
 43141 ccttagatta caaccctggca ctatttttcc cccctctaact attctgcgc tctgacttga
 43201 tcaaaactcta agcctctctg tgtcactgtc tccctctgtag aatagggtata aaatcacatc
 43261 tctaccacct gacatcacag gttgctatga gcaaaaagga caatgaggtta atgtacaaga
 43321 aggaatttctg acagatataa atacaataca atactgggta agggttggac ttgagattgt
 43381 tagaatttctg tctactctta aagactgact cctgaggtta ctactgtgac agactctgaa
 43441 ggttctctcc cacttgggtcc accctgtctg ggacagctct ggaacttate acaggtaggg
 43501 tgatgtcagt tctatcaaat atgtcatggt aaacttagga tccagatttt tattttacaa
 43561 agctcctaagt agctttggga acttcttttc ctttatgcca ttgcaactct acatcatgaa
 43621 atgattttgt ttctcacta gaggtagcca gaacaccagt gctgtatcca ctgttagtga
 43681 agcaqacatt taacagggct cagcaagtggt ctaagccatg ataagccact ctgtagtaga
 43741 ttttccagca actatgtgga cagaactct tactctcacc aaagaacggg tttgtgact
 43801 ttggtgtgtc ttcaagtttc aaagtctgtg tcaattgtgc taccactcca tactatttcc
 43861 tggtaaacaa ggaagcacac catgtcacgg atggccagaa ctactacttt tttccatgtc
 43921 gaaggttttc cctgtctctg catctaccca agtctgccc atcttccaaa cgtgggtaa
 43981 actcagacct gttgtggcct gaatgaataa catccacct tccctgtgta ctgttagtga
 44041 cctcccatca aaaaagcatg cgtgcttata actctccact agtctggagt ggccagaggt
 44101 aggaactctg ccaatgtctc aaaaattctt cgtatcttcc acaacataga cccaagata
 44161 tggcagttac tcaatataa ttcaattgatt atcagtttcc aaagtggatt tggatcacca
 44221 agtctcagc cagtatccca aatcttccat gaacaccttt ctcaaccagg taccctgagc
 44281 tgatctcag gttttctgga tctacagccc ttaaagaagt ggtcttagat acttttggtt
 44341 ggtcttggag ttgtttgcat gcctaggact ttttctgcaa atggcctggt ctgttaaaa
 44401 gggggacagc gaggggcgcc attttatccc tctccattcc tccctccagc gcacaggttt
 44461 gcttgcaaca gacacttga gaagtgttca gttcacactg acccataaaa ctgcaaaatt
 44521 ggggtgctac acatgaccta cttgtaggag aaaggcagga agaggtgttg ctcttgcag
 44581 atggctcttg ccacatgctt cctcttagcg tccagtgtgt tccactgaga cttagtctgt
 44641 ctgatcagat ttgacaagg ggggtctat ctccaaggtta gaaggagga attttgatca
 44701 gtccttgtat ctctgttaa aagcatttac ctccaaggtta gaaggagga ggaagtctgt
 44761 accatagat aaactcagag aaagaagata actgggtact tgacatttag accagggggt
 44821 gcaacaagtc ggcatcccca aagctgagtc aagctgtaga ctctctttt tccacctca
 44881 ctggacaatg tctaaacttt gtatcttcca catgccatc cccaccataa gcccttca
 44941 caccgtctca gtaacttttc ttggcccaaa agcccatct tcatgtctc tttcatttac
 45001 atattcttgc cattttttg gttcctgtc cacaatctc attgaaatgt gcccgctgag
 45061 ctacagaat aattcttct ccttctggt caggccagag agcttctgt cgcactgttc
 45121 agcttatcac cttagtagt ataccagta tactttattg accctggctcc tgcattagac
 45181 tggaaagcat ctgaggggaa ggtccatggt tcatctgcca ctgctccctc cttagtctgt
 45241 cccaagtggt ggttgagcaa acagcagatg ctacagaaa acccttaagc cagtgcatt
 45301 tctctcttg actgtggcac tcatggtcat cagactccct gttttcaacc ctgaagcaaa
 45361 tgaccaggaa cagcgccagc catgacagtg attgcccaag tttactatgt tcaactgagac
 45421 agcttggggc tcatatcag gaagatgttg cagggttcag gaggctcag gtaatatggt
 45481 gctccatgac cccagttaac agagaggaga ggggtgtcca ggcgggtggc agtggggcca
 45541 tgtttggtag ggggtgact gggggtggaa ggacaagaa ggcagagact ctaagctact
 45601 ccaactctga ggaatgagga gagggggaga acacaggtct tgggactt tcaaggcca
 45661 gaggcttgga gctggacaaa ggaagtcttg tgcagaaaag aacagaaggt catlaactct
 45721 cctacatcc atccccgaa ccttctcaga ggtgagtgt ggaacagag aagacaggt
 45781 attagagagc gtttgggtgc agtgacagaa caactgatcc caggccgtga gccctggga
 45841 gaggggagga gcttgactca agccttggtc tctagtctgt ataaaaaaca agcaggcag
 45901 gactctccg tgcctgctca ggttctatc atttctggaa ttgtatlaat aagagatgc
 45961 cctgtctctg gcacgacagt gctgacatg gatcacagt cccaggtct ctctcagtgt
 46021 ggtgactgcc ttgtcggaat ggttgaagc tcttgacgtg caaagtggc gacagtctc
 46141 atatttctgt tgccaatgt ccttctctg gcaacacat gatttcaaca cgggaaatc
 46201 catacagct atcctatgga gRaagaagat atcgtgaaag gcttctgtag tgcctggcca
 46261 ccttgggtac ttgggagga tttcttctat aaggtgggtc gacattatag tgcctggcca
 46321 ctttgggag gacttcttct tttcttctat aggtgggtc gacattatag tgcctggcca
 46381 gccaaggtg ggaagagaa aaccagttaa aggtgggtc gacattatag tgcctggcca

46441 tgcactgggtg tcttctccca ttatggtgtc gttagaagaat tagaaccacac aaaagtgtctc
46501 atgggactgga ggtgaaatga attctgtctc acagtgaaac ctgaaatctg taaaagagac
46561 cagcaacaga tcccatattt ttgtgtgttt aaaaatcacac caggattttac tgcagacc
46621 ataacccagc aaacacaggt gaagcatcaa aaataacagc ggggtgggtg ctgttagact
46681 ctcaactaag gttttaaaat tagacccaac ctgataagcc tggttgggat gatctgtctc
46741 tgagcttaag gggcagaggg aacctgggac accagttatt cagcccaatc caggtgtctc
46801 tatgtaacta gtcattggagc tgaectcagt attctgtttg tatatggtag gactgtgtctc
46861 taacacatga agatgagttt caagggccac tgcatacagc ttcttaaatc ctccacagaa
46921 caacactcgt cttgtctctt tctgtctctg ggggaaccag gagggcagaa atgatgtccc
46981 tctttagttt caggatgtaa gtatgtttat ctctctcgrg gtaaaaggaa acctgtcttc
47041 cttctggaaat ggccagcttg agctcatacc tgtccacag agaggatggt ccaggaaatg
47101 tcttctccca ttacaacttg ctggaagtaa gctgggtggc actgaagttt cttcttcat
47161 atttttttaa ccaattgttc ttctgacatc atttatttgt aaatatagaa tatagtctac
47221 catagacata ctttttcaaa aaagtatgca catatacata agttttggtg attctttttt
47281 tttctttttt tctttttttt tttctttttt ttgaaatgga gtctcgtctg gtccgcggg
47341 ctggagtgca atggcgcaac ctacagctcac tgcaacctcc acctctcggg atccagtgat
47401 tctctgtctc cagcctccgg agtagctagg actactggca tgtgccatca ccccaactc
47461 attttttgat ttttagtaga gacagttttc acctgttgg ccaggctgtg ctccaaectc
47521 tgacctcaga tgattctccc tctcggcctc cccaaagtgc tgggactaca ggcattgacc
47581 accaggtcgg cYgtgtttt aactttttt gcttggctca tccagcctgc cttctgtctc
47641 caccatatac agtctctttg cccatctccc ccatcaggac acccagatgg ttgttccatt
47701 tgtttctgca cactataca attctctgta aacatgggtg agtgcacaaa gactataca
47761 aagatttttg cattgtttgt tttatacaag tggcatgtga ttatgctaac ttttatcttg
47821 tttttctcca ttaattatcc ttccaaaaa tcttcttgag tcacttgta cagctctaac
47881 agattttttt aaaaagtcca tgcagaacat tccattccat ggctaaatlt aatttltcca
47941 cacattgccc catttgatgg catttgccct ctctcttttc cacttttttt taacacactc
48001 aaaaatctag aaaaacaaac tcttatatgt cctatcttca cacattactg cttttttttt
48061 ctgggtcag actcccaaa actaaaaat ctgtgtcaaa cagttattag tattttaaat
48121 tacagtatag attgctctgt ggcctctcgt tccaccagca gctcaggaca gcacactttt
48181 cctcaactgc ctgccagcaa cagggtctat cactgttttc cagttttgca gatgatgggt
48241 taaaagtaga taaatattct gtgtttacat taattctcat tcttctgact ccagtgaaat
48301 gtagctcatt tctatacact tgttggacag tcaattcttt ggtatgggtc aggccttgca
48361 tgaagcccat gctgactttg gtcttaggga ttcccaact ggtactctct gatttcttga
48421 ggcactggct gcagccaact tggttacatc agggagaaaaa ggtgcaggac ttatctccca
48481 cagcctacac tctctcagaa agttcccaac acRaagaaat gataaatgt ttgatgatg
48541 ggtatgctaa ttaactctgt ctgatcacca tacattacat gtatcaaaat atcactatg
48601 tctcaataaa tatgtataat taattgtatg caatttttaa aaaaagacagt taaagtcatg
48661 aagatggcaa catggaaagc cctccttttc aagaacagga gtctctcttg tatttggaga
48721 agaccaagga ccaaaaaata aaccactctt tctcctgcc accatacccc tctcctcat
48841 atacagttaa gtcttggaga aaataaagca taggaaagaa agaagctccc cagctatttt
48901 tgggtgatgt gtttggctct cgcgtcccaac ccaaatttgc tctcgttagct ctgcaatca
48961 ccagctgttg tgggagggac cgggggggag gtgattgaat catgggggca ggcctttccc
49021 gtgtctgtct cgtgattgca gatgggtgtc gggagatctg atggtttcaa aaacaggatg
49081 tctctcagca aagctctctt tgccagccac catcataata agatgtgact tgcgtccct
49141 cactctccgc catgatttgg agacctcccc agctcagtg gactgtgagt ccaatacccc
49201 tttcttttgg aaattgccca gtctcaggta tgtctttatc agcagcatga aaacagacta
49261 atacagacag agttttctga tgcatacaag tgcatacaac ttaacctcct tatctcgtc
49321 acacctagga cctacaaaac cctgaccagt gatgaggcag ggggtgatgt gggccagca
49381 acaatgggtg gcacatgggc cctgaccagt cagcagagat gcagctgcag tggccagca
49441 cgcgtgcagt gctgaatgcc agcctaggag ggggagccac cgaagccttg gtgcctctc
49501 gccctgcggt gaacagaccc tgcccggcca tgytccggcc acagcagcca ctgcctctg
49561 gaccccaacc caaagaccac caagcactag tctttagact ttctttaaat aagattttcc
49621 tgttttaaac aaagcatctc agttttataa tctcaagaa gtttaaagcat gatattttca
49681 gaaacacatg aaaaatgataa ttaaaggaac ctacactagg aaRgttaact aaagtctctc
49741 tctttttgat gatgtgtgaa actcagtaat tccctgatcc actgatgata cagtaataca
49801 atacttacag tccatccctg gcctgtgtca aacacacaag tctatctcct agcgacacta
49861 cacacatgct tgtgctcatg tacaacatga cttaactgga tctgctctc gacaaactct
49921 cagagtctct ggttttcttc agcaaggctt tgccctcagg gttgacagag tccactctct
49981 tccaggRtcca ctggctggtc ttcaggatga agctgcagag ctggggagcc taacactctc
50041 cctgagaatt cagggttagca gagcattgag gttgtctatc aagaatgaga ggtggccctc
50101 gaagcccgag gcttaatctc taactcagagc accaaaagga atgtgtgtct gaacaccat
50161 gctcgcgctc caacaccaca tgccttatca acatgcctcc tgggttctct gtgcaccaac
50221 ctgaacttag tctattgtct gacgttttcc cctcccgagg taacactatt cttaagtttg

50281 cccctaggca tgggaaggag gatgtccttt tattgtgttct aagagttactc accttaatta
50341 taaagagctg tggtttaata gaagcgctgc agactaggag tgaagtgtaa gaagaaaaac
50401 agaaagagcg aagaggggcca tccctcgttt ccacagcaaa tgctctcctta atgtccaaca
50461 aaaaactcgt tatatctatt agggcctatt tagagctttg catatagctg gattttcaac
50521 ggaattccatc ttattatcca gcactattca aataacttta tagaaatgtgt tgactatgtg
50581 gctgtctcaat atgggagcca gtaggcaggg tggctgttga gcaagtgtaaa tgaactaact
50641 gtgacaaaga atatgaattt ttaatttcat tccattttaa tagcccaatg ttgctatgtg
50701 tccacctatt ggacagcaca tacaagagct acggtactct ctaaaanaag tgcactgtct
50761 agcttgactt cctctcccca cccaaacccc aalagcagcc ttgagatctg ctccacaatg
50821 attgaactct agtacaacca gtctcaataa taagcaaatg ttatttttag acaaacactg
50881 atgtttatatt ttttttcttc ttccattcca tttttcagca acagatctctg tttagactta
50941 attataaaaa cgtcaattcca cagtcgagatt ccgagttgcc tgcctccatc atgcacctta
51001 ctgggctctct ctacagctga aatctacaga cccacactgc tgcataacta tatcatggat
51061 tcttattgca tctggaaagt taacgggaaa atactctga cttgcgaaat ttgagctggg
51121 cagaccacat ctacagcaatg tggctgactt acaaacagag gcaaacgtcc agtgccttga
51181 tcagattaca acagtctctg gatgttctgc gtttgcctag tacacaacctc ccgggaaggt
51241 cgcgtgttgc gcgcccgcgt gaacagggctc gggggaaagc tgtgggctct aggtcccttc
51301 tccctgcctc tccataacct tgcagttgat cctggtgcca tctcttgaat cagcagctcc
51361 agggactcca ctggaactct cagcctcata gttgtattgt tacttccgga ggtgcttga
51421 tccgtgtcca tcttctaagc tggggagaaa tactgcagcc acatagcaga aatagctctc
51481 ccaaggagcag ccaattctcg gcagagaggg gcagtggcat agagaaattaa aaatggtaat
51541 tcaactcaaa ttatttttta attgacttta tacttaattt tctcttatag ttttgactat
51601 tccattatgt ttttgcctg gctaatgttt aaattggctg gcatgtcttc aaatactcat
51661 ctgagccaca gcgaaggag tgacaagtgt caagtaatgg ggctcagaaa atctgcagta
51721 gagaccctct ggcaaatata gagatgacaa catlacgcaa atagtactat cttcfaatgc
51781 tttttagctt gaacacgcgc taattccgtg actctaaagc tactcaaatc ttgaagcaca
51841 gttcattaga cattaacgct aactaactta acaaaactct agaaaagaat ttctggaggt
51901 ttcactgttg tttgagagga attttctgaa caattgaaag aaaaagaact ctgggctctg
51961 agtccagctg cagtgatgac agacggccac tagatggcgg tgcctcccca cgaagaagtc
52021 gcccgcgcgc tccagcacac agggctcgcgc ttggaggcca tttccttttaa ccccagggcc
52081 tcaggtaaat aggaaggggg tggaggttgc atttcttcaa aaaggtttaa gtcagtattt
52141 cctcaccctc acatgcttgc aatcaatgac tagtcaactga taaaacagac atgactgttt
52201 cttcaaaagt tgacagagcc agcggagaga caatcccttc cctcccccgc cccagggctg
52261 aacttttggg acagaaacaga agccaggta gaagagagtt ggcattccctt ggtgtgggc
52321 agagggctcag ggaacttgtt tcttggggtc agagcaaggc acaccaagat ggcattcag
52381 cctctgtagag tgggagggcc tcagggacccc ggtgttagga gagtgcacgg gctggggc
52441 ccttccacgc cccatgcgca gatgccttac ttgacagac caggctgaca ttttccagca
52501 tttctcttcc tgtaagacag gaaaaagaaa tctgtgagct tcccactgac tcccagcggg
52561 tgcaggggcc cgacaggggg accaccggca caggtttcac ctttcaggag ggagggcagg
52621 tccggagacc cctcctcag cccctccatc ccgcgcccc ccttcaggc catcctgagc ctgacggggc
52681 cgccagctgg tccaatcccc caactcgccc tggaccctgt ggcctgcctc cctctggctc
52741 aggccacagg tgcccggccc aacctcgtgc cgccgctccc cctccgctcc cctctgcgcc
52801 cgacagcgcc cgccactca cggccctgg cgcccgcaa cagcagcagc agcagcgagc
52861 cgacgcgcgc cagcgccagc agcgcgggccc tccgcggggt cgcgcggggt cgggggggg
52921 cggctctctg gctcgccgct ggccctcgccc ccccgagStc cggctgggaa tggcgccctc
52981 cagcgagcgc aaccgagaag ggcactcaag gctgcaagag ccgcaggatt gcgaaaggtc
53041 cgcccgccag cccatttata ggaagccagc gcttctctac actggtctct gggctgggtc
53101 caaaggcgcc cctccgggccc gatttctctac gatgcagccc cagccacacag gggctgggtc
53161 tgaagagcct cggggagggg gcccaactgg agtgcctggc cggcgccctc cgttggcttc
53221 caggtgtggg tcccttcccc aagcgttctc gagaagcctg ccttcagcag tggactgact
53281 agtggggcca tggccRgcgc ctacaggtctc gagaagcctg ccttcagcag tggactgact
53341 ttcagatgac ccacatggg gacaaaaact ctgcttctcc tggagagcgtg tcccatcaga tttactctt
53401 gaggagaacc agtctctgag gctgtcttgg tggagacgtg acaccctaat cctgatcaga atctgtgct
53461 tccattttgg tggaccttgg atttgacccc gagaaggggg atgcaggagg gctcgtgtgag
53521 cggggggtcca gcccggtgct ggggagRaga ggttgggtgg cctcctggt cccagcagga
53581 tgcacagatc ctgcccctga ggttgggtgg cctcctgggt agagcaacct ccaggggct
53641 ctgcttctaa gaaaccccag cgaggagagg tcttgggttg aggtatgtga caggacagct
53701 acccctcttg tgcaaatgtt gaggcgagc ggttctctct catcgactct ctaggcactc
53761 aggtttctct catgttctc atagacatct ggaacctctc tctgccagc tctKagggaa
53821 cagtttctc caccggaaRc ttacacagc catcgactct ctaggcactc ctaggcactc
53881 gccatttcc caccggaaRc ttacacagc catcgactct ctaggcactc ctaggcactc
53941 cagcggtagg ggaatttcag ggaacctcgg gctgaatgct gtagactgac gtaggcactc
54001 taattgatgg atgacactat gatgactgca gtagactgca gtaggcactc
54061 ggcacttcca cctggttag ggaacaagc gtagactgca gtaggcactc

54121	tgtggtagga	tagagggggc	gacacccagg	taggtataac	tgctggggga	ccaccagga
54181	aggcagatgg	gagcgcccca	ggagcaagcc	ggtagagtgc	ggatggggag	gtgcagacgc
54241	ctgtttgcaga	agtcagttgt	tgctcattgt	tacaacttgt	caagctttgtt	tgaattatga
54301	gataMcccc	gatgaacaa	gctactgggt	aagactgatg	attccagaag	gacaaattat
54361	gaacacgtaa	ctatgtataa	agacccagtt	ccctcagagg	agactcacag	aaagacagtc
54421	gctctgtctc	tgacactggg	ctccacacct	gtccttattc	agatattgtc	attagacctg
54481	aactcctatg	ggcagctaaa	ctccctccag	tgatcagttg	ctcatccaca	gcataattat
54541	gttattaaag	atggatatat	cagaggtctc	aactcaagcg	tgctcatacc	taccacagct
54601	attttgtgaaa	ggctcggaaa	aagtaattgc	ctgtaaaccc	catttctctg	aaacatttat
54661	ttagaattat	ctatgtggac	tgactttcca	cagggttcgc	tgctgctagt	gtttggagag
54721	atggtctctg	ttccatgcct	attcacatta	aggagagtga	gtaagaaat	tcaggtatag
54781	agaagccaaa	aggaggtgtc	gagctttaat	ttacaagcac	aagctccaag	ttactctgtt
54841	acgtgcagat	gaacccaggg	tccaatggtc	agcatccata	gagaaatgt	accataatat
54901	atatattttt	tttttaatt	tatttatttg	agatggagtc	tccctctatc	accacagctg
54961	gagtgtagtg	gtacaaatct	ggctcaactg	aaactctgcc	tcccggggtt	aagcatttct
55021	cctcgcttat	ctccccaagt	aactgagata	acaggtgagt	gccactatgc	agcgtaat
55081	ttttgttttt	tagtagagac	gggttttcc	catgttgatc	aggctgtgct	tgaactcctg
55141	acctcatgat	ctgcccgcct	tgccctccca	aagtgtcggg	agaatgtaat	ttttatgaag
55201	taggaatcaa	aaatgaattt	gatgacttgg	aggcagggaa	acattgtgag	atgctttgag
55261	gtgtgtagag	gactgtcacc	atctctaaag	gaagaaacct	aagactcagc	ttccctcttt
55321	tcttgaaWgt	ctttggcagg	tcttccctga	actgggcccc	agccagcagt	agttatcccc
55381	tgacagggct	tagcacaaac	ccacagagca	aatgttgaat	tgttgagctg	actctgcgtg
55441	actcacggaa	atgctgtaaa	gatttagtga	tagatttttc	tccaattaca	aaatccactt
55501	agatcctttg	tcaaagacta	catggaaata	catctattgt	gccaaagact	ataccctctt
55561	atcccttttc	ctttagatag	agacacattc	tggtgtccaa	cagatttaac	tcagctagtg
55621	actgtgactt	atcagctcat	aatgcaaa	tctgtttggg	tgaccactca	actctggtag
55681	tcatagggct	ctgggtaccc	attagaagc	caactgacta	gaggaatttc	aacggcgatg
55741	ataatgctga	atgtccagtg	tacattatct	agaagcaaaa	tactcaattg	tgcctatctg
55801	cagccgacaa	gaagggtctt	ggccaaagtc	agggaatcat	ggaagctaat	aaagggcccc
55861	agcagaccaa	tattctgaat	ttagtgtctg	tcacRtactg	agcagagtgc	ttagaacata
55921	atttgctgaa	tatgaatgaa	tgaatctgca	ccattcagct	atacccccatt	tccagggata
55981	tttatgctata	gcgacccgtg	tgcttaataa	aatatttcca	gtgacataaa	gcaagaaat
56041	acagttctata	ccaattattc	ccagccatgc	tgctccaaaa	tctcatctgg	caaataggga
56101	tcagttattga	caacgattaa	ttagctatc	ctgtttctgc	ctRtagacgc	attataattg
56161	caaatgatgc	ccagaagctg	gaaagtaaac	ttcaaacatt	gtagatggaa	ctgtgcccaa
56221	gggtggcctgt	ttaccagatg	acagcatgca	tgtgtgagca	cgtgcacaca	cacacacaca
56281	cacacacaca	cacaatagag	aactatcagg	aaagaaatgg	cacatttagg	gatggatgat
56341	aggaggaaga	tgataggggt	agccattgtc	aaccaaatgt	aggcatccca	gaatgggttc
56401	taacccctgc	gagaagcaaa	aagaaacttt	cccttcccat	cattctgcct	ccaagagat
56461	aaggtcagca	tgttgagtcg	cagtctctcc	cgggagagaa	gccagaagtc	agcaggggtt
56521	aatgtgcagct	gaggagctgc	gtaagtgaat	tatcacccct	ttgcctattgt	ggatgctctc
56581	cttccaccca	ccaggggctg	gctgcagccc	ccactactgc	actgaattct	tctctgggaM
56641	agccccagct	agacttcata	ctgttgtagc	ctgattccct	gtcatlgaat	ttcttaggtg
56701	gacaaagcat	atgaaaggcc	ttcatataaa	ccgtgtgttg	tccgtaaac	tttttctct
56761	tatgacatta	tttgattttt	catgtgttta	ccgtgtgctt	tgccaattgg	agagagaagc
56821	tggagagaca	atgaacctatg	gtagtctaca	gattgtacc	ccgtgtctct	tcttctctac
56881	tgacacccct	gctagggcag	gcagatggta	gtcaagcagt	aaacactgtg	attataatgt
56941	aaataggtcc	atgtgaatag	gtttctttca	tatgcacact	tcatttttcc	ttctgtagtg
57001	tgctgcttat	gtttacatct	tcattttagaa	tgcaacagca	acttggagct	gtaggagaga
57061	ggaagggctc	gggaactggg	gccatgggac	agttttctacg	gctctggggt	gcagctccctc
57121	atctgtgtga	tgagaagaca	ggaatggagc	gtctcttagc	cccatlcaag	ctgactactt
57181	tgtattctata	gaaattttg	gggctgaaaa	aaacaaacaa	taaatltatt	tgtctgcata
57241	cctcatggct	atttaggagct	gtggctgagg	atccagaacc	atcagaagcg	aaggaattta
57301	tgaggaggcca	tcgacctctc	caaaagacctg	tgcccaactc	gcccaagaaa	tgaacacctt
57361	caactatttt	acacagattt	ctaaatcaga	tggtggcagt	ccctcctgag	gatgctgggg
57421	cacagggaa	tgcaactctc	cggaaagttg	tccccaactc	tagcttttag	tttccatttt
57481	gctcgacctt	gggttaacct	tcttagatat	aacttagcat	ttcttttgaa	aggcttttgg
57541	tcagcttttg	tcagccactt	tttactactt	ttaaaaaaag	ttttctttat	gtctctctac
57601	gactaagctg	cagaacgtgt	tacctcagaa	agctgagacc	agtgctgggt	ccgtagagct
57661	ggatggataa	acacacctca	ctattccacc	accagactca	ctctctctca	tgattattag
57721	agcactctcg	agagcttcca	gaccaggaga	agggcataat	cagacgctac	agccaataat
57781	gagcgtacgc	aatgtcccca	gtgtgggttc	tacacacaa	ttagactata	gttagacagt
57841	gggggtctcg	ggggctctcg	atgggtgaga	ttgaaactgc	ctcggaaatg	tgggcagagt
57901	ttgggttaact	gaagaggag	gcacactgaa	agtgcaatgc	cagggaagctg	ggaacattgt

57961 ggaatgtgtc ggccccctgtg atgacgccag gctactggag tctctgggga gaaggtggac
58021 agggggatgtg tcaagtgggg atacagtttg ccatgccca ggcaggggaca gaggcttcag
58081 gctaattgaag cctttgacct aatttgacac taactgtagt acatatggca ctgaacctct
58141 ggaattgtgtg gaagggccatg agaattgggc tgaattctcc ttgttcaagq ctatgaagg
58201 aaatgtagca acaggtatct gtagtctcaa acatagacag gatcttagaa accaaatcgt
58261 gactaaatatt ctcattctat agagaaaactg gggctagac gaactctgag ttttltgtt
58321 gttttgtttt gttttcatga caagagcaga ggtaaggcga gaactctgag cttttagttt
58381 taactctatt tattcattct actctaatg cactaaatct aggtcggcta caaaaaatt
58441 ctggagattgt gctctttggg ccaggcatgg tgccctgtgc ctgtatrtcc agcaactttg
58501 aaggccggag cgggtgtgga taacctgagg tccagggltc agaacccag agcggaact
58561 ggtgaaacc catctctgct aaaaatacaa aaattagcca ggcatggtgg cctgcacctg
58621 taactccagc tactcgggac attgaagcag gagaatcgct tgaacccagg agcggaggt
58681 tgcaagtgcg cgagattgtg ccattgacat ccagcctagg tgacagagcc agactccacc
58741 taataaaaaa aaaaaaaag aagaattctt gaaatcagtg tatctcttg tgtattagt
58801 gttttcaca ctgctgtgaa gaaatacccg agactgggtt atctataaag gaagaaggt
58861 taattgattt acagtccac atggctgggg gaggcctcag gaaactgag atcagggat
58921 aagggttaag agaagcaag acctgcttta catggcaga ggagagagac gaggtaggag
58981 cgaaggggga agagccctt ataaaaacct cagatctcgt gaaactcag tccactgtac
59041 aagaatgaga tgggggaaac caccoccatg atccaattct cccocccagg gtcocctcc
59101 aaacatgtgg ggaattggg gattacaatt caagatgaga tctggggagg cacacagcc
59161 aaccatatac tctgtlaact tttctcttat tgaagatgaa aaatttcat gattttttt
59221 tgggtttgtt tttagaata atagtattat gtaactcatt acataggatc atagaggtt
59281 agggcctaga agggccataa gggtattgaa tccaactctt cctcatcaat ctgagaatcc
59341 ctggccacc attaacagcc tgccataact gtggaatttt atgaatttag atcagttct
59401 aggcagcatg cagtgaaag tttctagaag ggaacacctt ccagcctgtc tctctacac
59461 tggccagctg gaggctgcac atgtggatca gtgctttgt gcatacttc tggctatgc
59521 tatttctgtc cccaatccgg ggcatagact gtccatcaca gggaaagcca ggaatKgtca
59581 gactagagtg gaaagtttt ctgacacct ctttactag attctgaagt aaaaaccaaa
59641 taactaccag aatggcctga cactgttttc atctgtatgt tgttccctct ctgatagat
59701 gggagagccat caggccattg ccagagccca gactgcttag gttacttgt tctcaaagaa
59761 gaaagtgggt gaaaatgggc catttagtat caggaaattt ttggttttct ctttttagtg
59821 gtgcacttga cttctaata agtcatttta aaaaaataa gggccacctt aggtgttcta
59881 agggccacc tcagagagcc acagataagt atattcact atctgcgaat atgtcaatgg
59941 attcacaaaa atcaatttta gaattttta atcaccoccc aaagaactct gtaccaact
60001 agccatcacc ccttaagtct cctacctgtc cagccctagg caaccactaa gttactttc
60061 ctctctacag atttgctgt tttggacatt tcatatacat aatattttca aggttcatc
60121 cttttgcaac tggcattttt cacttcccat tccattgtat agatattcca cttagatga
60181 cttttattct tttttattac tgactaatat tctactgtac agctatcagg aataatgctg
60241 attcatcaat tgatagacat ttgttttgtt acacacatgc tttcatttct cttagatga
60301 ctatgaatat ctgcattcaa gtttttatgt gtaattctat gtttaatatc atgagggaat
60361 tatctaggag tgaaaattct gggtacaatg ttttacctat acaccagcaa tatatgaac
60421 gacagattgt tttccaaagt ggctacacca ttttacctat tttttattct tttatatc
60481 tcccaatctc tccacatcct tgtcaacact tttgtgcttt ttgtttgtt ctatgatgg
60541 ccatcctctg gagtggaag ttgtattcta actgggaatt tttatacttc ttttggaa
60601 tattgatgtt gagcatctt ttgttttct ttttaattg gagtgtcttg acatagact
60661 attctactc aaattctttg gattttgaa ttgttctact tttctttaa atgcaaaagt
60721 attaaagtgt aagagtgtt ttgtcctct ggattcaggt tttcttccg acatgacct
60781 tgcaaatatt ttctcttatt ctgtgggttg ttttctact tttctttaa atgcaaaagt
60841 ttttaatttg gatgaattaa ttgttttct ttgttctact ttttcttgg gtcatatga
60901 agaaactatt gcctaaaaa tggctcaagg attttactcc ttgttttct tctgaaggt
60961 tctagttttt aggtcttat tctaaggcta tgatcccttt ttagttaatt tttcatgtat
61021 aaaggaatcc ttgttccctt gctgtttag aattttcagg acctgttccc tctccgggtg
61081 ccttgagtta cctctctctg ctcttgccta atagggcgtg cagctcttat tagggaactg tctccgggtg
61141 acatcagccc tatgtctcaa tgagcagaat gactgtctat tagggaactg tctccgggtg
61201 ggtcttttcaa agaagtgaac agagctccag tcaactgagag gcaggagccc gaacccctg
61261 cttctccagag aaaaaaatag agatatctct ggtctccgaa ggtcttctat ttaacatgt
61321 ttgaggtctg taatgtcctg ataatcttct tctccttttc attcagaag atgaatttca
61381 gtggctagag acataaggct tctctgttat ccaaaacagc ctcaagcag ctggaatga
61441 acatcaaaa ctgacaacaa atacaagttt aaaaaagta cctcaagcag ctggaatga
61501 tgtcttttgg tgtgaatgag aagaataaga gttgggagtg gggatgcgca gtaagatg
61561 ggaactagaa acagaccaac aaaaatgag agcacccttc acagaccaa atactcag
61621 tgcagatgtt gaagatgggt aatacttcat ctctgtcct cagtgagca agaaattg
61681 cctatcattg taatatata tatttgttaa cctcagtat tctcaagca caaaaacg
61741 acccatcatt gtgtagtta actttcataa attactcat ttctacttc aaaaactctg

61801	caaaaatagat	tttttaacca	gccatcttac	aaatgaggga	gccaggggcta	agttttacat
61861	aactaaccaa	attctattgt	cttcattata	taagtacagg	tacctagaag	agccagttat
61921	gaatatgtaa	gatcaaatga	ccaacataag	atttgagtctc	agtgcactttg	gtgtgaagct
61981	atgagttgcc	ctctatctgg	agaaaataagc	tactgtcttta	ctgtcaagcat	ctgcagctac
62041	acaacgcctt	atgattttgt	aagggtcttg	gtttccattat	ttttcttttaa	tccctgttagc
62101	tgtgagtttt	acgtttacaca	tccacaggtga	ggcaccctgaa	ccctccctggg	ttgtaaaaagc
62161	ttttccaggat	cacctggcat	ataaatagct	gagctagaac	tcaaacctagg	gtgtttttgac
62221	tttatatccc	atgcagctca	tactacacgc	tcttgaatct	caatgagagg	attaggaagaa
62281	ctgagattct	ttatggcatt	tgtttagagaa	ataaaggcagg	agggggctctc	gagcctcggt
62341	ggccttccag	ggaggagagg	caacacgaaa	atatcacagc	gattcacctgc	gattcaagac
62401	gatgggaatt	agaggcattt	cctaggggct	gcctttgata	gtatccagat	ttctgaagaa
62461	atgcgcttag	ggaaaagcat	aaacatacgg	aaatacctgt	gcttgcctgt	gttttgaagt
62521	gttcttaattg	taaatgtcgt	ttattacaat	ttttcccttc	taaatgtcct	cgctgacttt
62581	cccccaagtag	gtaaacaa	agctgggctc	agccatctca	gttgtttttt	aaactatttc
62641	ctgcacatgt	ccaaatttgt	gctttacatg	gctgatccta	ccagatatac	aaactgggat
62701	gtgagattct	gcatacacct	cagaaaatac	ctctgaaaat	gagttgttat	gaatgatgat
62761	gtctgtctcgt	cattttgaa	agggcctggc	actggagctc	cttggggaa	actggccaat
62821	ggccttctcc	accactgctg	accctggggc	aaagctggag	cggagctcaq	tcattttaat
62881	tgaaacaaat	caatagaaaa	tggttaattg	agggcaattaa	ttaaactgat	tcctttcttc
62941	ttgactcttg	ccacttttca	gcctggacaa	tttagttgaa	agttggtgat	gagctcctga
63001	ttatccagat	aattacttct	ttctcacctc	attaaataca	tcggcgtRtc	tccctttgga
63061	aagtccaggt	agctatttgc	ttcccttactg	gtcagaaaaa	taagagcctt	ctctgaaagg
63121	gggaggcgga	aaggtggggg	agtcagggtg	cagaggcgag	ttcttagacct	gacctaccta
63181	atgcgcttag	catcctcagg	gcaggctcagc	ctctgtcttg	agcctgattc	ccctcctgag
63241	aacgtctctc	tctcaccccc	atctctcaat	ccctttctctc	ttctctttctc	tctccacagc
63301	ctctctctctc	tctctctctc	tctctttctc	tcggcccccac	accaaatctc	agctgtcaatc
63361	ttccacctca	ctaggaaagt	ggctctgctc	attctctctc	ctcttttctca	cccttgcgat
63421	ctgtgtctcc	ataacctctg	aattcgtttg	ttttttgagt	tattttatga	acggggatga
63481	tgccagatgt	ggaattcact	actttgtctg	cttaacaaag	taccacagac	tgggcggcat
63541	aaacaataga	catctgattc	ctcacagctc	cggatctctg	aagttcaaga	cttaagttact
63601	ggcagagttg	gtttcttttt	ttccctctcat	tgctgattct	gggtgtttgt	gtgtgtgtgt
63661	gttgttgttt	tttgttttgt	ttgagacggt	gtctcaactca	cccaggctgg	gtgtgtgtgt
63721	tgcaatctca	gtcacttgca	acctttggct	cccagcttca	agcaattctc	ctgctctcagc
63781	ctcctgagta	gctgggatta	caggcaaccg	ccatcacacc	caactaattt	ttgtattttt
63841	agtagagatg	gggtttcac	atgttgccca	cgctggcttc	gaactcctga	gctgagggtga
63901	ttccaccacc	tcagtctccc	aaagtgtctg	gattacaggc	gtgagccacc	atgctctggc
63961	tgagttcggg	tttttaatat	ttaaagtttt	ttggtatata	catattctRta	agttaaaygg
64021	gactataatt	tttctatctt	tttaatttta	ctctatgtgt	ttataactct	gataagcagc
64081	ttatagataa	atactgtttt	aaaatttaaa	attttacttt	ttaaattgac	agaaataata
64141	tgcatattca	tggagtacat	ttacatggga	tacatatata	gtaatcagat	tagggtaatt
64201	agcatattca	tcactctcaa	cattgatcat	ttccttgtgt	tggggaacat	caatatctct
64261	ctcttagata	tttgaagcta	tgtaacgtat	tattgttacc	tgtagtcact	ctaaggttga
64321	atagaaacct	tgaactaaaa	tctatctctg	tgtaattttg	tatccttttat	caaatctctc
64381	ctctatcctc	ccgttccccca	tcattcccag	cccttagtat	ccctgttctc	acttttaact
64441	ttctatagat	taaaagctgt	ttcatttgag	gcctctctcc	ttagcttata	gtggcccttc
64501	ttctccctgc	atctatacgt	ggctctccct	ctgtgcattg	ctgtgtccta	agctctctct
64561	ataaggacaa	cagtcataat	agatttagggc	tcactctaac	aaactcctct	aatctcgta
64621	ctcctctgaa	gatcctatct	gcaaaatag	tcacattctg	agccatttgg	agccaggttt
64681	ttcaacacatg	ccttactttg	ctcgggctgc	cttaacaaaa	tagcttcaac	aacagaaatt
64741	tattttctca	cagttctgaa	ggctagaagg	ctgagatcag	agggagggct	gtctcctttg
64801	ctttcagacga	gctgcttttt	caactgcatc	ttcaatggaa	ggaggatgag	tggggaggaKa
64861	gctcctctgc	atcttttata	agggcattaa	ttcaatcatg	agggctctac	actttataac
64921	ctctataacac	ctaactcact	cccacaggcc	ccactctctc	ataccatacc	acgggggatt
64981	agggctctcaa	tatatgatt	ttggggggca	gaactgagcc	ccctaattgt	gacccgggaa
65041	cgcaaaccaa	aataggtcta	caactcttgt	atttctgtg	aaaggctttt	aaaattcttg
65101	ataagattct	gtcaactgac	tagctgacca	ggcacaagtag	ttcctaattg	cttgagaggt
65161	ctcggagtgt	ggcctgcccc	gtgtctgagt	gcttcttgag	atgggctttg	gtcatgggtg
65221	gtcggcagct	ggagaaaagt	tggaggttgc	ctctagggca	caacactggc	agattttgga
65281	ctgtactctg	gtgaccacac	aaccatgaaa	ttcctgtggca	ttcatctcag	gagtaggaca
65341	aatccagaaa	actactgccc	taggacactc	ataaagcctt	ccacagagct	cagaataaacc
65401	caggagaagg	aacgataaag	cttgttgact	tttgcctctt	ggaggctatc	tttctccatg
65461	cagagataac	gcactctag	gggattaaag	gcaggctcca	gagagctatc	gactccccag
65521	caccttcaag	ccagcaatcc	ttttagctca	agagataaaca	tagccgctaa	ccctggcctt
65581	ctcaggaaag	cgaggtcagg	gctttgatgc	tgtgagtgat	tttgttggga	aacaagagat

65641 ataagggtgt cccttgcaag aaagaaacac actataaaaa aaactataaa ttgaaaaaag
65701 attattatitac atgagatat attgcttcttc aggaagatcac ttgaaagaaat ttttttggct
65761 attctatttat gagatttttta aagtgcacatc attgacatcaa accagacctaa aataaagaag
65821 acaataaatac catatttggg aaaaaatgat attaaactaa gaaacacttgg taatttttgt
65881 ggtctgagga gtgtgatgaa ctcaacagca gtlttgctctc attatagcga gagactttac
65941 ttgtctgttt caatctttta aatttgttga gttctgttta tggcacctaa gatgktctgt
66001 attggigaac attccatggg caactgagaa aaagccagta ttctgtctag tttgtgtgat
66061 ttttttcaaa atggcaatta gatcttgttg gttgagggtg tttgttgtgt tctttacatc
66121 ctgtctgttt ttgtctgctg gtccatttaa ttgtctgaga taagggttgtt acgtcagcac
66181 ctataaataa agctggggct caaaagccaa aaccaaacac actgtggccct cagctctca
66241 atcaatcaat aaatcagtga caaagcatgt attggttaat ttcagcatcc ttggccgtat
66301 cctggatgtt gaaggaaga ggagatatgg gcttagttaa gaaacacttg taattacatc
66361 atgtatgaaa tagatatgta taggtctatg ctgatgtgtc gaaacacttg taacttccct
66421 ttctaaagat ttttttttt ttgagatgga gtlttcaact tgttgcacag ctgtgaagtc
66481 aatgggtcca tcttggtcca ctgcaacctc tgcctccggg gttcaagcga tttctctgcc
66541 tcagcctgcc gagtagctgg ggttccacca cactggcta atttttgtat ttttagtaga
66601 gattgggttt ctccatgttg atcagactgg tctcaactc ctgagctcag gcaattcaac
66661 tctgtctgcc tccaaaagtg ttgggattac aggcgtgagc caccacgttg ggcctttacc
66721 gattttttat ttgtcagtc attcactcctg tttagccagac ttgtgttctag gtaacctatc
66781 agagcaataa gaagaaaagg aggccttcca catgctgggt gatctagga gacgttact
66841 ctgtgtataa aacaagtggg tctcacacag acccaagaag taccacgat ttatgcagac
66901 ctagRtaact atgtcttctt ttgtcagtc tctcttctt ttaagtagtg ggaactaccg
66961 cgtggctagg aactcaagct ctgaagccag gggccttttc agtttctgcca ctactagct
67021 ggtctgttg gggcatggta tttaattcct tggcctctgt tttccctatc ttgaaaaagg
67081 agatcaccaat aaatgatacc taccctgacag ggttttgtat ttataaata agttaataca
67141 gataagcaact ttggcacagt gctggtaact ggttaatagt ccRtaagtat taatttatc
67201 cattttgtcta ccaatatact ctctcagctt cagtttccct tcttctatggt gatgggta
67261 ttccagtggt caaacataac atccacttcca gactctccc caagataacc aagatgagta
67321 caaaatgttt ttcttttagt ttacttctag caagacctat ataataggtc aaactataag
67381 accaaatctc accttaagag agataaagtg gctgctggag tcatgggtgg ttgccaaagt
67441 agatgaactgt tttttcaaaa agaccccaaa cctctgagag attttgtcaa tcaattcttt
67501 ggtgtctgtc agaattgttca atggacattt ttgtgttatt ttgtgtttat taagaatgtc
67561 catgttatat ctttttttac taggtggaat ttccactttt tagtggaatt gccacttct
67621 taattttatac aaaaatttgt ttacttctt attttgtatc ttatactctt taactcagtt
67681 tctgcagaaa ctttgaagct ttcaaatatt ttttccagtg aggtatctct ttacttctt
67741 taacatctat gtaaaccaag taataactct ctcaagttaat ttataaaaa ttatccaaa
67801 cataactatg ggaatgcat ttgaactcaa tcaaaaaaat ccagtctttg gctgaaagt
67861 gagttgcttt tgaaacttct gaattgtgta ggggatgagc aggcgtgccc tggccaccag
67921 tatccaggac cccagccccc aRtcagggat ggaaagttaa cctcacat aaagtctgtt
67981 agtaggatttc ttatgttaa gaattcagag ctggaattca tcaattttgt atttttttat
68041 gtaggggaaa tactttcaac gttttagttt cattgaagat gaatactca ttgcaaaaagt
68101 Yccctccat tcaataatcc aatcagttgt tccaaaacct ctcaagctgt tgcactccc
68161 agatctagct gtggcaccct cacaagggag aaagagactt cagccctgtg ggaagtctc
68221 tagttgtcta taacttctt tacctatccc ccaagtata ggggtttta tgaatggcc
68281 aagattcttt aatttttatt ctccctctc taccctctg aattctcat taattttt
68341 ctgaccataa caactctttt aaaaccatac tatcatacca ttcaaaagat tgcatttca
68401 gggctgtatt tcaacttata cacagttct caatatata ttatggact tcaagtttt
68461 gttatgccag gtttaagatt ctatgttccc catataaaagg aagattcagt ttgaaattt
68521 Rtaatcagag agatgaatcc tgcagaaca aaaaacctta gattaggac agggaaaaac
68581 ggaacacaga aaagagatc caaagaagta agaaaagata agaaagctc ttgtgtgccc
68641 catcttgctc tggcccaacc tctStaggtg gagatggcca ttgaagctc aagtctaggc
68701 tctggccacc ttggcctctga gccatcgaga ccaagcccca caggatctgc ctctgagca
68761 cctcttctct actaatcagt caagccagta gctgggtctc ctgtctctaa cctggttcca
68821 ctgtgcacag agagccctgt agtcccatgt cctaaaacat gtgaaaggtt attagacaa
68881 ttgggtcatt ctgtctatcc tgaaccaa atagactccag gggcccaagg gaaaaagcac
68941 ttggggcaca aagcactgtc tccaagaatt aaatttttct tagtagctgc tgtctaaac
69001 gccgtgttga accctaaagc cagttttgccc tagtagctgc taaacaacac ttgctctaa
69061 actaatttta cttaccactg tcaactacca gtcagagctt gcagctccc aagactctc
69121 ttatgtccaa agagttttct ttcaaaacag tatgtgata ttctcttctt gataaaaStc
69181 ccaactctct ttttgttctt cagactagg gaagaccagg gagtctgcgt gtttgtctg
69241 aattggaatt ctgtcttccc aaataaaagg tttaaaatt ggagatttgt tctgtatatt
69301 taattgaact cagcagctgc agtctctgtg aaagcagtg tgcagcagtg ctctctgcaa
69361 ctgtgctatc tgaactagc tggcctgggc ttgagacctt attggaact taattgtcat
69421 gtgattttga gcaagtcact tgacttctct atgcattagt tcttcaact

69481 aataagcgca gccctgccct ataaagttaac tcttgtgata ataatttaaat gaattaacat
69541 ggcttaacag cactctggcaa aagttagttaa agacttatac ggatgtacatt
69601 gttgttaatt ttacattgtta acgtgtgacaa aaactcatggt ttgcagcatac tcttccattca
69661 cttgagctccc catggctgat gcgctgccaa acccttgcta cgtctcttcc ttgtgccctc
69721 tggcttcaagc aggggtggact ttctctggaaa gtaaaatgcc atgacactgtc tattaattttg
69781 aacctataat gacattgccaa tttttgttag tgacacaatt agtcasactt gacaaattttg
69841 tatggttttaa tctaaaaataa gtaatgctct tggcataaac ctgcaaacaa accaactgcac
69901 tctcacctct gaattatgac ctgacctccc gttttgagaa ccaagttttaa tgtcaacttt
69961 ttgagctcta gacttggccc ttttgggctt gctactctct ctgttaacccc taggtgtgag
70021 gaatgataat aatgatgata ataatagggg atctctata ctgttaagggt tatatgatga
70081 gttgcaaggg gaacagaaat cactctaact tagaataagt ttgcttggtat attttacccc
70141 agatttagagt agttataaca taaggcatag atggccagat ggtatccctt acccccattc
70201 gccctataag gatccctaac ttcaaaagtc taatgttlaa taglaagtga tagttgtcaa
70261 cttcttagttt aaccttagaa tatttatata tcatgggaca acttccctagg cacacagatc
70321 tgtcacaana agctgttatt tccataccaa gaaaaagctg ggcgaagcat ataaacagac
70381 agttcccggt aaggacaga attcttaaat taggtgcagt ggcctactgt tataaaccca
70441 accactctggg agggcaaggc aggaagagtg ctgagccca ggaattcaa accaacctgg
70501 gtgataaaaa gttacaaaaa aaaaagggtt tgtttgtttt ttaagagggt caacttagaa
70561 gcatctgggc atgcactctg gagtcccagc tctgtgggag actgaggggc ttgagccggg
70621 gatgttgagg ctgcaatgag tcataatcat gccactgtac tccagcctgg gtgtagaac
70681 aagacctgtc ctcaaaaaa acaaaaacaa caaacgaaca aaaaattccag ccaatattac
70741 actgagttac aactgataaa ctctctacga gtltggaggt tcatactccc tccatgaga
70801 tgtgagggaa gaggggagct atactcctat tgactcactt cctctggacc actctctatt
70861 gttgtccagc acttagtttc aggtttgaag ataaagcttc ttaagagggt cagtttagaa
70921 atgcaagact atcttgtgtt tatgtgccat atgctctttt catgactctc attcgtctca
70981 tctcatctca tctcatctca tctcatctca tctcatctca tctctctctc tctctctca
71041 tctctctctc tctctctctc tctctctctc tctcatctca tcccatctca tccatctca
71101 tcccatctca tcccatctca tcccatctca tcccatctca tccatctca tccatctca
71161 ttggtctctg cctgagtcct gtgtgagtcct cgtgtgctgt ctgagccac aggaagaaga
71221 tacatgacac tatccttgcc ctccaaaaa gtcagaaagg ctcaaacagtaa gtagaagaaa
71281 atgtttagaat cctgatgcac ctctcttgct cctgattcaag gatltcaggag cttattttcc
71341 cccagatttt gggtaaacag ccaaaaacaa gactctcaca tcttaggtgt gctgtgagag
71401 acatcacctt gccataatac atcggctttc ctggagglaa agtccaagtlg gaatgtctgt
71461 tgtcagcgcc atgttccact gatatactaa accctgcac tctcctctcc tttttttttt
71521 ttttttttgt ggtgaggaat atggagtaaa tatctcctgt gtaactctgag agcctgcaga
71581 gagaggtgtt tgcagagga ggcaggaaac tatctatatt ttttttttgt ggttttgag
71641 tcaacaagtga tgaagtgcac caaaaaaag ttatgaatta tagtttatta tttccattac
71701 tcttccagcc tctcctggg ctgggaactt cttctctggg cagagacaga taccatttac
71761 ctgtctggct ctgcttggtg tgttttaaga gggcagcaag ttggcctcca aggttttctt
71821 tccatctctg gatttgata tctctggatt tgcgtgagtg tttcagacaa cagactaatt
71881 gctctgctgt tgttgtctc cctcctgctt ttgaaggatc ttatttcaag tgtttgccc
71941 tctctctcct atttccagat tctgcttgtt ggcaacatgg tcaattccag catgtgaatt
72001 aggccttggt gtacattctg tttcaggtct cagtgatttg ggtgcacaa gggccaaatt
72061 gtttaatttt tagaataccg ttttctatc ttlaaaaggt caataaagac catcttgtta
72121 ctgcacagat ttgaaacca gaYctttgtt tccatttttg ctgttttttg tttcattttt
72181 ctgttactgt cgtgtaagcc ctgagatca ctctactct tctgctctct cgttttctca
72241 cctgcaaatg gggggtgat ataccactaa ctcataaag ctgtgagga ttaagtgaag
72301 aataaaatgt aagtgctta taacaaatgc tgcatacat taagtacca atgataatta
72361 aatatcatca ttatctgtca gtgtcaattc gaggattaac taggaaacaa tgcataaagt
72421 gattagaaca gtgcataaa agcatgcat gttgtttccg tatgaactct tctgaattcc
72481 tactacctta aaaaattttt tttcatcctg aatcactagc tactctctct tttattctct
72541 tactaatttt ccacaatgta ctctccaaaa atgtagatca cacacagttg tccattttc
72601 ctcaacttca ttcaactctc agtcaatgc aatccagtat aggcctcttc caactcaaa
72661 aaacgtggaa actgtcctat taatgttgcc agagctcatt gaacaaaccc agggcgagca
72721 tctgaattct tatcctgctt gacctgccta cagcttttga cactgatgat atctgcatc
72781 tctctgaccc cctctctctc actgggtttc atgtcatcac ttctgtgag tctctctgcc
72841 gcttttgact caggaccttt gcagcttgct ttacaactgt tgcctctccc ctctctttaa
72901 catcagctct tctccgggct ctgctcttgt tactctttat ttcaacttat ctgtggcttc
72961 aacttctacc tctatgtgta gagctccaca tttatagctt cagctcagtt tcttctctgt
73021 agctcctcac ctaacaaata taatggacaa acccaaccaa tggctgtct tggaggaatc
73081 ttaaacacaa agtgttttaa actgaataca tcatctcacc taccctgac tcttaataag
73141 tctctctccc gtgttctctc ctgtgtattg taactgttat tctgtctctt catatgtcaa
73201 agccggaaac ctaagagtca tcatagtctt tctctctttt tttttttttt acctactgat
73261 cccataatac ataaggcta agaagtatgc tttttaataa ttttctccaa ccttctctca

73321	ctgcctcaga	tgtgaacatg	gctctcctgt	gttattataa	tagtctcctt	gcgctccagt
73381	gtgcctacga	caaatcattg	tgtggctccc	tgaatttttc	acgctgcctc	acgctctcga
73441	gtccaggatg	atgcctatgt	ctgcctggaa	tggtctcctc	ccattagtgtt	gaaaaaaagt
73501	atataaactc	tctctagcct	tccctgatgt	cctctggaca	ttttagttgtt	gctccgaagt
73561	ctaccccatg	gctttgaatg	tatttccagt	gtgtgaatat	ctaatttttc	tataactagt
73621	caacttggcg	tccatctatc	cggtactatg	aaactcttaa	aaatgaagac	aaagcctttt
73681	caattttgtc	atcttagtgc	caggcaccac	aaaacttttc	caactggatg	ccccacaaac
73741	cttctcaata	tgaatgcctt	gctgaatgac	tgaatgaatg	aaattgttga	accaactctt
73801	tctatctctt	gtgtcttgag	tgtgggacac	aactactctc	ctcaactctg	gtgacaaata
73861	tcttcatcac	tcttggttga	cagagatggt	aactaacact	aaaacagtgt	agttctctct
73921	ggccattttt	aacctgtctt	tttctcaagc	cccagctacc	tataageagt	gataaatgaa
73981	acttatccaa	ggttaagtct	ttgtccata	gaaagagcat	ccctttgaat	aaagcacagc
74041	attgatagga	gtgcttctgt	ggtgcacagt	tgaatttgaa	caggatgttg	atattttcga
74101	gtatagtttt	tacctggcat	gtattttaaa	ggattaataa	aaacaaagt	gagaatttatt
74161	tgcaggtcac	ttttttaaag	ttStgtatac	aaacacaaat	acacacacac	atttctcaat
74221	tgcataatca	aaaacattta	ctgagctaca	gtacaaccca	tcaactctac	tcttgggtat
74281	tgcctccagaa	gaactaaaat	caggatctca	aRgagatatc	tgcattttgt	tggtctatgc
74341	agcatctttc	ccaatcccca	agatgtagaa	acagcctaaa	ttgtctatgt	cttgacagat
74401	gaatgtcRgt	aaagaaaatg	tgatgtatgc	aaacccatga	atactattca	tgcttaaaaa
74461	aagaaacttt	tacaataggt	gacaaactgg	atgaactttg	aggacattaa	accaagaact
74521	ggaagataaa	atccaacatg	attctacttt	taatgaggga	tataaaaaat	tccaaattcat
74581	agatttcagg	tagggatggt	ggttgccagg	ggcttgggga	aagaaaaaat	ggcgagttaa
74641	taattcaacg	gcacaaagtc	tcagtgaagc	aagatgaatc	atctctagat	atatgctgta
74701	caactcatcg	cctatcatca	gcaataatgc	attcacacac	tcaaatttgt	gaactttctg
74761	atttcattgt	aagtgttctt	gctacaataa	agtaaaaaaa	aatacttact	aaataacaaa
74821	ggaaaaaaat	tccatcttta	gtgcagtaga	tggtttttag	caattttctc	tatctgtttg
74881	gtcacaccta	acatagagaa	tgcttttgca	ttgtgtcttg	tgaattttgt	tctagctcta
74941	cactttataa	aactttgtta	tactctgaga	aaaggcagag	agttccacttt	ttaattcttt
75001	tttatgactc	agtaaatgaga	tacaattttt	atttttaacga	aattcttttc	gatttagaata
75061	aagaagtgat	tttcaaatgt	gaaactctaa	ctctctggta	catggaccac	caggtcacct
75121	cttaagcaaa	agaaccaatc	agtttaatac	aatgaacaat	aaagctatga	agggtagaat
75181	ataatttata	tttctcagct	atgtgaaaaa	tgccaccatg	ccagctttca	cttctctctc
75241	ctttatcatc	taaatgtata	tttgaaatac	agcatcataa	actaaatgga	tgttttttaa
75301	ttgtcatggt	agactttcgc	tggtcataaa	gctggctgat	attattttct	attatctgat
75361	cagccaatca	aggcttttta	aatacaaatc	ttatacaact	ctccaaaaat	aatgttatcat
75421	aactaaatgc	acctggtgtg	cttaactggt	aatttttctc	atcctttatt	actcaatgag
75481	taatgaatca	attatgatag	agacagttat	caatttRaa	tatataaaag	aataaatatg
75541	ggacacatac	ctttttctaa	agcccaactt	tttcaactgt	cttcagatca	ctgaattttag
75601	tgaatgaatt	aattttgcta	atgttaatta	tctgtaaaga	atgtattacc	ctaaataatc
75661	aggattaaaa	caagcccatg	gtgtggcttt	cttttttttt	taagttgagg	tattattaca
75721	caagagaaaa	gaagcaattc	taaaattatg	atggaattaa	tctgtggttg	agttgggtta
75781	gccacaatgg	gaaattaggg	gacagttaat	cttctgataa	atcatctcgg	atttagacta
75841	cacaatttgt	tagaagttat	ttgggaactt	agaggacaat	tcccttaggt	aaattgtttc
75901	ccctaaagtt	ccagcaatgg	ggtgtattctg	aggcttaaaa	aaataaaaac	ccccagcccc
75961	cccaaaactg	tcttaccacc	acaaaaagag	aagcacacaa	gcccaatgat	tttaagaagt
76021	aaagctagat	ctgcttagat	gcaaaatttt	ttgtataatc	ctcagatttg	accaatgat
76081	caaatataca	attagcaaa	ataagcctct	gaactgcaat	aggccaaact	aaaaaaaaaa
76141	aaiaaaaaat	caYgacggcg	cagccggaga	taagagatgc	agccagattg	tttctctctc
76201	tgttttttaa	agcagcagtt	atggtgcagc	aatctaccac	aggggtatct	atgctctcca
76261	accgatgac	agaagtgaac	ttcaactgat	tgacacacaa	atgtttttca	cttactttgt
76321	ttttggacat	gctgctcgag	tcggagggaa	attggaaatc	ttgtacacac	cttaataagg
76381	gtacacatag	acactgcatt	tttcaggaaa	tcagtgtgac	ctcagatttg	gtcaaatgat
76441	tcttagatcc	cattggaagt	gtgatactgt	gatgctgaga	atctgctctg	agacattttt
76501	tagttagatt	tggggcagta	aaacatattg	aagtgtagatt	ctgtcactct	aaagatttgc
76561	tctctctttt	catccagggt	tatatgacta	ttctttctac	tacaagaatg	gcaaaatttc
76621	agtgaggaaa	actaatcatt	aaattttttt	ttttttttct	tttttttttt	tttttttttt
76681	tttttttttt	ttaccacaga	gctctttgat	catctggtaa	gaggttaacga	ctctctatag
76741	aaactctacaa	atgcccgaaa	aaatttgcac	agaaactcaa	aggtttactc	agctactgaa
76801	atccatccctc	ggaccccccg	aaactctcta	atgaagatgt	ttactgtgac	aactggaggga
76861	tcaggttctat	accttactct	tctctgtctg	tgacatgact	tttaccctct	accacagacg
76921	agccttcaat	attgccccag	agacccacct	tgacctacag	tgcttctgata	tgagggccac
76981	acaagctcac	ctaggcaaga	tgtgtcactg	ataactctac	agtgtagata	ctgaagtctt
77041	gtaagaatgt	cctagtggca	aaagttcaac	ctaagcacag	tacatctaca	atacaaatat
77101	agcaagtctg	gggtgacaga	ttttctacat	tgttctactt	cttctctctc	ctctctctct

77161 ggtctatagt taccgtgcac agtgacagggc cagacagaca gaccacacac cccacttgcc
 77221 tcagactctg tccctgtactc tggctcttttc tcttttggtt cctcatgagc caaattctctt
 77281 aggaatrgct ctgaatgaac cctctggaaa tctcttaggat cccagctctga tctctcccttt
 77341 gtgatgtctt tcttactgag gactaatata ttgttacctg ttgtgacatt tttaatatYct
 77401 tagtatctgt tcaattgtttc tgaccatcct ccttctgtag cttaggtcctt gagagacaaga
 77461 gcttctatgga tattaccctt tggagctaaag aaatggatca atttgagatca gtttcaaatc
 77521 tggattgtaac tattaagaac ttaggcagggt agcaaggctg aatcaaaaatt gttctaggaa
 77581 catrtggaata gaaagggcat gctgtctcct ctgcrTtttt caaacttttt caactttttg
 77641 cattgttaata aatctttttcc ccatracagt agagrtatca aaatattggt aatagagaca
 77701 aaaaattatc gaaacaaaaa ttaccataat ttacccatac tacatgtgct gcactctatt ttctattcgc
 77761 ttcaattttta tattaaaaaa acaataagaa acactgttca ctgcccattca catggatttc
 77821 atgaccactc aataggtggc gacttgtttg caaaacactg ctgtattccca tgggtattgga
 77881 ttaaaacttga caaggaaatc tgctctgcct tgcattcttc tctaaaaatcc ataanaaggt
 77941 ttttttttct atttattaat ttacataata ttcaagaga atctctataa cagttctgaa
 78001 ctgggttttta tattaggtttt cacagataac aagtggaaca actcatcgcc ataaccagtc
 78061 ttggcatattc aaatcgacgg ctatttccat ctatcatgc tgcacttat catctgattt
 78121 ttccctcgct agactcccca ccttggtggg aagtaaccaaa aaagctagga atttacctta
 78181 gccatctcag gtacccagga ggcacttaac gaatataga aaacagaaat ggaataaac
 78241 tcttggtcaa aagccatgtc ttggcttgcc atgttttggg acatctttgt tccgaatttt
 78301 tatataaata tctctctctc ttttttatta tactttaagt cttaggtttac atgtgcaaac
 78361 catcgagggtt tgttacctat gtatcacatg acctgtttgg ctgtgctgac ccccaacttc
 78421 gtcattttaca ttagggtartt ctcccaatgc tatccctccc caaccocccc taccocat
 78481 caggccccgg tttgtgatgt tcccccgcct gtgtccatgt gttctcatgt ttccactccc
 78541 acctatgagt gagaacatgt ggcgtttggg ttctgtctct ttgtataact ttgttagaatt
 78601 gatgaaaaact ttatgtaatt cttaataatc atactttctt cataacttat cgccattcca
 78661 ttaatggggtt ggcactggaa acatttccca agctttatagg gaattcttca atgaacatag
 78721 aggaagctact gagagctaaa cactctttgg ttccgtcgct tgattgtggt ttccccagaa
 78781 ctcaaaagaga aattttcaga aaggccaata aaagccoccca acaggagagt ttctgtttgt
 78841 gctagtttttc ccaaacagct ggcttcccta aggcgttaat ttgtagaact ggtttctacc
 78901 agactctaaa tccataatca atgataagct atcaagcata tgccttaatt ttctgttaatt
 78961 tgggcttttt ctaggccaaa ccaacatccc tggggaaata ccaaaataca tctgttctaa
 79021 ggaatgataacc ttatgtctgg ggaggtaggg ggtggacagc taagacttgg atgaacatag
 79081 gactgagtaa tYgtctaatt aatgaatgag tgtatggata atcaaaagtc aaatgctctg
 79141 tatacatatg taggtattca gaatttttta tatgcattta tatgaggtct ttttccctga
 79201 tgacctagga agggaaaaa cggcaataac atagtcttgt ggttacttgg ggaagaaaaag
 79261 tcagggtgag aggagaaaac tgaggggagc aaacagaaag taaggagaga agaataaaag
 79321 aatgagaggg aaacatctgg cgggaaaagc aggaaggcca gcagctctga atcgagatca
 79381 caactctttgt tagtcatctt tatcttactg gttactttgc tactcaaatg acacatttcc
 79441 tatggtggaa actcccttgt ttacttattc ttccgtgacc aggtttaaaaa ggcctgccta
 79501 accatctcag taggcttttc ctactgtgata tctctgtgag ctgtggtaga gaaaggggaa
 79561 gcagtgccct catggctcct ggattttacag ttcttgagga agaactgaca aatgagtgga
 79621 gacttcccta atatacaatg aagcagaacc ttctggcgag aaggaaaacc ttgtgatgtg
 79681 caatgacagag gctcactttt ccactctgtg ttgtatgagg gttttgagaaa agagccacat
 79741 tctttccaaa agtcagggtca gaagcctttc cacacttgg ttcccccaatt agcaccocgt
 79801 aatgtcaaat aaaaagaaag ccttgcgcc actttggaat atcagcaaat atctctttgc
 79861 ttccgggggg actgtgttct ctcaacaatc ctcttggaat tatcattcca tactgaaaca
 79921 aggggtttgat cttttcaatga gatgtatggt gatgaaata aggccagggg ctctggggag
 79981 agaaagaaag cgtgcgcctM ctgctatgcc ctgagaatac agtgagatgga taagtacat
 80041 ctctagagcc agagtgtctg gatctaaaaa ttggtctgcc aacaagcatg taagtacat
 80101 agctttttta tttttcatat gaaaMtgaa atctatagga taaaagtctt taatgaaagt
 80161 caatagaagt gacgcacta aaacagtgct tgcgatagt aggcattcag tgaggtgctg
 80221 gctattactg ggggtgaga acagaaaacg tcatttgtct aatcccaagt ttatttttgg
 80281 actttgtttc tttctgttaa taaggaccag tagtttcaag aatctagaaa ctgtagaact
 80341 gaaaggaacg tctattttat ggctatgtaa ggtctggaga ggtctggagcc clccagtggt
 80401 acgcagctac ctgggtggag ttccaagacc aaacaccagg ctccocattt tctggaccac
 80461 tctccactct accaccctcc ttctttggag gacgatgtcc aggaccaaga cggctccctt
 80521 agggcaatga taacaactgg aactgtagta gccctcccaa cggctccctt gtcatcaaa
 80581 agacaactctt aagcKggttc attcatctat tcatctact agcactgctt tttaagctat
 80641 tctcaaacag tacagaaaaa cgaaacacag ttctctattc taaagactct ctattgaaat
 80701 tagagcaata agatatgaag ataaaaatt acaatagtac aactcttacc tatataaat
 80761 atttatataa ttatttttta taaatataa tatattttat atttataaat tatcataaat
 80821 tacaactatt tatgttaagt gtctaatgat acatatattc tatcataatc ataataatga
 80881 gtgtctagta aaagagttaa cattaaggtt aataacatta tgaatttcta aaataatgaa
 80941 acaacagcaa gcaaggaaaa agatgtcaa aggttttaata agactttaata agacaaaaaa

81001 agacacactg ctagaaggat caggaaaagtc ttcctgcagt aagagtaagt ggcattagat
81061 rtgggcccgt aaacatgaat aggttaacga attagaatgt gacctttccc tctctctccc
81121 atggaataat attttctaaa ttgataatata Ygcaaatgtg tacataatac cgtcaaaaaa
81181 aatgaataac aattctacat aaatttttcta tggaaattga aagacaagaat aacataaatt
81241 gaatcgaana ggcaagaact tccagcaatt ctgctcgaagg caattgaaga
81301 aataaggggg ttgttttaag aattatcacc acatatgaac tctcagtcga tctgtaacag
81361 tggttctaaa cttttttgac accagggaact ggtttttgtg aagacagact tccacggat
81421 ggggatcggg agtgagatgg gactgggggtg ttgggggtgat agttttcaaga gaaactggt
81481 ccaacttaag tcatcagga ttgataatctc ataaggagttg caaacactag accactagca
81541 tgaacaggtc acaaacaggt tcatcgtccc ttggaatgt ttaactcgtgc tggcttgga
81601 gggggcagag ttccaggccc aatgcgtgct tgcctggacc ttactcctgc ctaftgggcc
81661 tggaaacctaa cagaccagag agtggtaact gtctgtggcc tgggtttggg atccctgat
81721 ctataggata cagacaagt cactcctcac aaggaagaag gatggctatg atccagattg
81781 gagagacaag ctgataact ggatttctac tgcacacatg cctgtgtatc agtggagtc
81841 ttaagttaat tattggataa taactgcagg ggaactcag agccactgca ggaactcagg
81901 ctgataagag aagtgggRgt aaaaatacag agaagacat ttgttctata atgcagctg
81961 ttttccaaag cagctacact atcttaccat cccactcaga atgaagcagg gtccagctt
82021 tcccaactcc acattatctg tcttttcaat tacggtcatt ccaatgaata tgaattata
82081 tctcatattg ttctcaattt gtattttctc gatgtttaat gatgtcaagg atctttttga
82141 gtgcttatag gcaatttgta aatcttcttt gagaataatc tgttctgttg tttctgcag
82201 ttttaaaactg ggttgtcatt tcatccttga gtgttaataa ttttttttta cggctcaagg
82261 tcttttacca gatataatgt ttgcaaatat tttcttccat cctttgtttt tctctctat
82321 tttctttatc ttatgttttg aagcacaatt gttttataat ttgtatgaag tctatttat
82381 gctgtttttc attttgtcac ttatgctttt attgtcatt tttagaacc atctaagaac
82441 caaggtttaca cagattttact tctatatttt tttctaaaag ctttatagt tttaacttt
82501 catgaagttc tatgatccat tttgagtatt tttttttggc atgtttgag aaaagtgtcc
82561 aactttactt taaaaaata aactttactt tttagaaatt tttagattac agaaaataatt
82621 gagaagatatg tacaagaatt tcccatatat gctacgttct cctctattgt tgggtatgt
82681 ttttcaacta aatgaaccaa cagtataaaa ttattattaa ctgaagcca taatttattc
82741 agattttttc aagttttata taactcgtct tttttttttt ttttggtagt ccatatag
82801 ataccacact acatttggtc atcagtctc cctaggcttc ttttggctg acactttctc
82861 tggctttttt tgccttttaat gaactcaaca gtattgagga gtatggtagt caatcataa
82921 agtgtctctc ttgtgggatt taactgatgt ttttattatg attagattag ggtatatagc
82981 ctttagactc ggtcaggat atgtgttttg caaatattgt tttccagctc tgaattgtgt
83041 cttcatcttc ttaaaaggtc ttttgcaaa aRgaacattt taatttttaat gaagtccaac
83101 ctatcattct tctctatatt tctttttgga agtttctRag tttttgtttt tacatttatg
83161 tctaatccat attgagttaa tttttttaa atgttttaagg tttatgtctt gttttatttt
83221 atttttttaa gatRattct ctttctgctg cccaggctgg agWgcagtg catgatctYS
83281 gctcaactga acctccactc cttgggttca agagattctc ctgcctcagc tccccaagt
83341 gctgggata taggcaactca ccaaccaccc tagctaattt ttgtattttt agtgaagta
83401 gggtttccac atgttggcca ggtcgttctt gaactcctga tctcaagtga tctgtccacc
83461 tcaagctccc aaactgctga ggttacagca tgagccactc ctgcagacct atgtctttgt
83521 ttacattttt acRtgtagac ttccaaattgt tctctgacat ttgttgaaag gatgattctt
83581 tctccatgga attgcctttg ctcttttgtc acagaagact tgactatttg tgccttttga
83641 tttctaggct ctgtatgcca tccagtgat ttatgtgtct attctttctc gaagtaccga
83701 ctgtttttaa ttgctgaagca tcatagtaag tcttgaagct gggaaatttc agtccattga
83761 ctttatctct ctttaattat gtgttttgta ttcagggtct tttgtttttt cgtataaact
83821 tttagtctag ttgtttgga cccataatgt agcttctgtg atgtcgtcgt ccatataggt
83881 tgaatctata aatcaattta tgaaaaactg acaattataa gctgcgaat ccaataatt
83941 ggaactatgt tgcattcatt tagatccttg atttttttta atcagaattg ggaagttttt
84001 tgcattgga cctatcact attttgttag atttatttca ttttccagtg tttataaaa
84061 tgcattttta tcaagtata taaaaggcat caacttttgt atacagctga tttctattgc
84121 aaacttgata taactcactt tttagttccag gaatttgttt ttgtgattat ttgggatctt
84181 ctacatggat aatcatatca tctgtgcagt cagataggtt ttctctag atgtccaggt
84241 acaacatgga gtaggaaatg tgagagacat tcttgcgtg tatataaatt tatgggaaa
84301 aaattcagtt ttctcagtat atgttcaaat ttttttttct ttttttttgt agctgtttt
84361 ttccaagtgt agaaagtcca tctttatttt tatttttgtg agagttttta tcaagaaagt
84421 cttttggagt ttgttaagt cttttctgc atttaattgt atcatcatgt tttttctcc
84481 ttatgtactg gagggtttg gtataattca gtgtgtgat ggggtatatt gatttaatgt
84541 tgaattggat ttgaatacct ggaataaatc ccaacttggtc atgattttga attcttttt
84601 atacatcatt gaatttgatt ttgtaattat tttaaaggat tttgtctctc atgttcatga
84661 gagataattg tctgaatttt tccattttga atactcttat attagagccc tatgtatggg
84721 ctgtgaaagt caggggagga aaacagctca caattttatg tgaataatc aatgtttg
84781 tgtcctctgg tcccctgcac gagaacttca caagctcttc atagctccct taccctttgat

84841 aagacagagaa gtgtatagg ggcctggagc aggaataat atctttcccca ggtggggtaa
84901 ggctctgtgta aatcttttct cctgcgaagt aggccttggt tatgtgtgcat tatgtgtgcat
84961 tattttcaaaa tgggaacttt ttctaccacc tgctagagcc atgagagctt tcttgactct
85021 cactgtgaaa acctggtggg gttcctagag tgtaaaccca tgaacgtgta gttgctgctt
85081 gtattgactga ggctcccatg ggtttctcac tctcagacta gctccacact agcgtccagc
85141 aattttgtcaa aattaccatt ttaattttcc tatcaattta tggcaatagt gatctctctt
85201 ccagggtaac agatctgagt gaactctctgg gttcagactac ctgtccagat tttggaatga
85261 ctgcctctgaa acctcagttc cctgatggat ctgagcaaa gattgactt tatgtttatt
85321 cttttttttt ctcttattgt aagatcgagg gtgatgactt ccaagctctt aacatcgagg
85381 gctgaaactt aagttcccaa cttcattctt tgcattcgaa tatgcaattg taccagactg
85441 gcttgttgaa aagactcttc ttccaccatt gaactctgtg acactcttcl caaaaaatca
85501 ctttaaccata aatgtgaggg ttatctctcg gactctcatt ttatctctgt atctatgtg
85561 tctactctta tgcacaatcc acactgtctt gattatgata gctttgtagt aagtttttaa
85621 atcaggcgagt gtgagtcctc caactccatt gtctcttttc aagattgact attccgggtt
85681 ctttgcaatt ctatatgatt ttttaagatca gcttttaaat tctctgcaaa atgcacataa
85741 aattttaaag tagattccct ggaatctcca gatcagtttg gaaagtgttg atctttaaac
85801 agtatataagt cttaactcat tccatttatt taggcctctt taatttcttt caaatagtct
85861 tctagagtttt caatatacaa atattatact ccttttggtt aattttattc tacatatgtt
85921 atctttttagt gctattaaaa ataacttttt ttttaattca ttttttagatt gctcatttgt
85981 agtgtcttaga aataaaaattg attttttatg attgacctcc tatcctgcga tctcgcgaatc
86041 ctgcacaaacg tctatttttg gtttttaaat tttttttcag gttttttttt atggttttga
86101 gtatttcttt taggggtgatt gcttaaacgt tctctggttc aataaaagt attttaaata
86161 tgcctcgcaag agttatcaat tggattgatt attatactaa aaaaatactc taggttaagt
86221 ttgtgtgata gctgaacagt agctagaatg agttatggag ttgagagggg atatttttgt
86281 catgggcccc ctgtgagggg gttttatagg tgaagagaag aagccagatgg gaagaaagag
86341 ttgtgatacta gaaaaagaa ggagacgggt gatgaagaag tggcaaaagg atctcaaggg
86401 agtggtgttag gtgtagctac tgggtctgaa ataccttaag gtttaacctg tcttctcaga
86461 tatgtgggaa tgaactcagg gtatagatat gaatgacat gtggctggga atgtacaata
86521 aaaaagctga caggaaagcaa gatgctgggt gagagatgc ttgataacct caatttctcc
86581 atacatagat agtccagggg atttgctgaa gggagaggtt ttgagagagg tttagaggtt
86641 cggaaataact atttagaaaa caatttgaaa tttagaattt aaagccatct ttttaataga
86701 aagctcttct aatataaaat ctctaaaggc attataatga atatatattt taagaggtt
86761 aaaaattctct aaagtctttt taatagaaga aattctatca agaagaatag aaaattctct
86821 aaagtctttt taataaaaata ttctccatat tactaMggca agtgaatca caccagaagt
86881 aagtggtgat tctataaagt cctcgtctgt ttaactatcc ttgaccacag acccacttgg
86941 gcttaagaga aattttagct aagcattatg taaactatcc ttgtgacctg aaatgatcta
87001 ctttgatccc cattaccacca acccctttcc tgaattcttt atgttctctg aaatgatcta
87061 atgaggaatt ggtttcttct caaacctctg ttggggataa taacctctgt acatgcctgg
87121 taggatgatc atgcttctgc cttaaggctt atatcctctg atatactctg gaatatata
87181 atataNaNt ctctcggaat atatcctctg atgtaaaaa atatactctg ttaaacata
87241 aatctcttga atctatccct taacatctgc tccaacagaa actgaagctc gactagtgt
87301 ttttttcttc cccagagttg tgcttatgca tgtagaggtg ttaagagctg tatgtttgt
87361 tctccccacg aagtcataata ttgaagactt aacccccag tgtagatata tttggatgt
87421 ggctctttgg ttgtaaaagt aggtggggcc attgaggtgg ggtgctctg atgggattag
87481 ggtccctata aaaaagagatg tgagagagct tgtttctct ccttccatgc ttgcaaaaga
87541 ttcatgtgta acacataata agaaagtgac catctcgaag ccaggaagag agccctcact
87601 agaaacttgac cctgccagca tcttgacttt ggactttcag cctccagatt gtgagaaaat
87661 aattgtctgt tgtttgaacc acacaaacta taatttttta cctgcagcct agcagataa
87721 gacataaWtt ggtactgaga agcagggtgc tactgtaacc ataatctaaac ttgtggaagc
87781 agctttgaaa ctgggcaatg ggttaatgggt agagggcaga ataatctaaac ttgtgtgtt
87841 gtgtgttga ttatttttat tttgtagac gctcagacct ccttaagctt ggaactcga
87901 ctggaactct tgttctcaag cgaacttcta cccctttttt gctatgttgc ccaagctaat
87961 agtgttaagt atcaaaYgg ccaaaatacc ataggatata atctatctt atgttctggg
88021 atacatgtgc aaaaactgca gatttgtgac atgtgtatac acgtgcctat gtgtttgtc
88081 gcaacccata acccattatc tacagttagt atttccctaa tctgctacct ccttatccc
88141 ccaacccctc gacaggccca ggtgtgtgat gttcaectcc gctgtctcgt gtgttctcat
88201 ttgtcaactc ccaattatga gtgagaatat gctgtctgtg gttttctgt cctgtgctac
88261 ttgttgaaga atgattgttt ccaagcttcat ccatgtctct gttaaggaga ctaactcgt
88321 ttttttttgc gctgcatagt attccatggt gtatattgtc cacattttct tctcagctc
88381 tatcactgat ggacatttgg tttgttttca agtctttgtc attgtgaaca gtcactgaat
88441 aaaaactacat gctcttatag tagaattgatt tataatcttt ttggtatata cccagcaagt
88501 gaattgtctg gtcaaaaggt atttctggtt ataatctctt gaggagatgc cacaactgca
88561 ttcattggcca tactggccaa tghtaattat agatttcaat ctatccccat caagctacca
88621 ttgattttct tcaagaatt agaaaaaact accttaagt tcatattgaa

88681 gccagttaac ccaagacaat cctaagcaaa aagaacaaag ctggaggatt cttgctacct
88741 gacttctaac tatactgtag gactacagta accaaaacag ctgtgtactg tgcacaaaac
88801 agatatataag acctatggaa gagaaacagag gccctcagaaa taatgtctaca catctacaac
88861 caactgtgtct ttgacaaaac tgacaaaacac agggcaattggg aagaggattc cttatttaat
88921 aaatgtgtgtt ggggaaactgt gctatccata tgcagaaaac tgaactgtga cccctctcct
88981 acatctcttga caaaaattaa ctaagaatgg attaaagact taaatgtgtg acctaaagac
89041 ataaaaattct tacaagaaaa cctgggcaat accattcagg acatagggat gggcaaaagc
89101 tticttgacta aaacaccaaa agcaatggYy acaaaagcca aaattgcaca attgtactta
89161 attaaactaaa agagcttctg acagcaaaaag aaactatcat cagaatgaac agcgaacctt
89221 cagataggga gaaaattttt gcaactctat catctgcaca agggctaata tccgaactta
89281 acaaaagactt taacaaaatt tacaagaaaa aaaaaacac cccatcaaca agtgggtgaa
89341 ggatattgaac agacacttct caaaaaaaga catttatgtg gccataaact atgaaaaaaa
89401 gctcatctatc gctgtgtcatt agagaaaatg aaatcaaac cacaatgaga taccatctca
89461 caccatctag aatggtgatc attaaaaagt caggcaacaa cagatgtggg agagaggtgtg
89521 gagaacacgg aatgctttta cctgtgtgtg gggagYgtag atgaggccag aagagtttgt
89581 agttgcactg tagaaaataa aacattaaagg gtgttctggt gccaataaac aggaacatgt
89641 tattggaac tggaagaac gcaattctgt ttataaagt gcaagtagct tggctgaact
89701 atgttctgtgt gtgttgtgtg aggtaaaact tgtaagcaat gaaactggat atttagctgt
89761 ggagatttgtt aagcaaaagt tttgaaggag aagcctagtt tattctgact gcttataata
89821 aaatgcaaaa agaaaaacat gaattgaaga atgaattttt aagcaaaaaca ttttgaaaaa
89881 ttctcaacctt aacattattg caaagaagaa gaaagcttgt tctgaagaga accataaggg
89941 tgtggctaaa caaccatttg aaaaagatca tgggtgcaac tcaagtactt attcagacct
90001 ctcaacagag gctgggaata cagattggat tatgccaatc gagatattgc cagtttgaa
90061 taaaggagac gaaaaaggtg gtgagaaatg gaggaaggct tgcagacttt ttgattttta
90121 caggtatgaaa ccatagagta tttcgtttg aactgtgtgt accctttcaag aacagagaag
90181 gacccaaagt atgattcaga agtccctagg actgccactc caccatgttc ctgRggccag
90241 tgggacagcg tgcctccacc tcagtttcaa agggtagtgc tgtgccccag agatcatgga
90301 tggggacttt tagaatttc aatggatgga gcttccccct accctgactt gggtaataa
90361 ggctaccccc acagaactga aggggttggg ccaccacag agctgggggg tgacaattgcc
90421 acctcaactg acctcgaaa ggacagacat caaagcaaa cggataaact ttgactttta
90481 agacctaatg gaatttgtct tgctaaagtt ggacttgcta tccacctttc ttcttttgta
90541 ttctcccttt tggaaatggga atgctatccc tatgctgccc ccacactgtt atttggaa
90601 catgtaattg gtctgttttc acaggctcat cactagaag gatttttttt ttgtcttcag
90661 gaataattat acctcaagt ttaccatatt ttgatttga tactatttag atgagcttct
90721 agacttaaga actgatgcta caatgagtta agacttttag gctattggaa tggagcgagt
90781 atataatttt catatgagaa gaaaatgaat ttttggagtc caggggtgga atgttacagg
90841 ttcaattgtt atgctctaac cctctgccca ttatatattt gagggccctaa ctccccagct
90901 gatggaaatt ggaatatggg gcctttgaa ggtaattagg attagatgag gttgtgtggg
90961 tggagccctg taagaagaga catcaggagag ctgtgtgtgt gtctctctct tctgcacat
91021 atgtatacaa agaaagaagt atgtgagcac atggtgtgat gggcgccacc tacaagccac
91081 aagagagaaa ctgagaatga aacctacctt accagacact taactttgga gtctaccoga
91141 ctcataaagt gtgagaataa aactcttttc ttttaagcca cttagtctat ggtattttgt
91201 tatggcattc tgagctaaga caggagttaa tatttattaa ataccaccta ttctcattgc
91261 actgtgcctc atttaatttt aaaaacaaac taggaagtag gttttagat tggcaattgt
91321 cctgttgaga aaataaagct cagcatcaca aaactagtaa gtatggcgag atatatatcc
91381 attgctcttc actccaaaga agctgaactg attattctc taccacaaat cccctcccc
91441 acacacttat caaccttgtat aactaacccc caatacatag atatgtttta ttgttaggt
91501 tggattctat ttctcccttt ttcaagctaa tgattaaaaa tgaactgaca tctctgaact
91561 tggtaacaaa tattgtcttt gatataaat gagcaggtag acatctacgt tactttttga
91621 atggctatat ttatatattt tgcataatg taactactgt ttgtgactat ttgtcaaca
91681 aaccccttat ccccataaaa caactttaag ttgtatcaag tctctctctg ttaaaagaaa
91741 gcaacacaaa tttttaaaag atgcttcaat aaacagccag tatacctatc ttttgggtta
91801 tgttgaagct gatttgtagg atatagctcc aggaagtagaa gtatgtgtca gaagacatac
91861 aaatttttta ctttctagtag tctctctac tctctctac taataatctt ttctctctag
91921 ttcttctatg atttcatatt tttaacatta ttcttggat tcaatctgaag ttatttttgg
91981 atcaaatagt atgaaaagtt tgaaccttag taatttttca taatgcaatt tatgacaaa
92041 tcaattttca acattgattt gaaatgtctg ttttattgca taaaataatc ttatatatac
92101 tggtaattct ctggactatc aattctattt ttgtgtcta ttttataat tccaattat
92161 ttaatatccc catagcagca tgctaaaatg caaaggccct agaatgtagg tgaactgagt
92221 caaatctaaa ctctccatt tatgaaatat gtgactttag cctagccctt aaagtgtatg
92281 tgtttctcat ctctctcatc tctaaaaaga taaaatgtca aactagtagt gctcaatgac
92341 tcttcccta agccaaaaat ttgagatgga cagaagagag gaagggtttg aaggaaacac
92401 ccttaagaaa ccaactacag aaagtccac atacacacac aaaccttga ggttcatgg
92461 ggaagcagaa gagtctggg gacttatata ggttagaagt ggtgaattgg aaaggaagg

92521	catcaggggg	aactttttag	aaataacttg	agaaaaggag	gttctagttt	taccctgtta
92581	ttgcccactt	tgctctgggg	gagttgagct	cagaggtgag	attgagggaa	ctggaactgt
92641	tttggaactg	agtgatgtgt	tcctagtaca	ctgtaaaatt	tggtctgaagc	ttgctctttg
92701	gtggaatatt	agaggatact	cagagcccca	caaaatagcy	gtctcaaaac	caaaaacata
92761	taataatgca	actgaaggaa	tatacactaa	tgatgaagct	aggactccca	gggtaccctt
92821	ttccctactg	ttctcccaag	gaggaaggta	tgtatccagc	cttgagctctg	aggttaacct
92881	acacaccacc	agtcctgaag	gctgtcatgg	acgacagcct	ccactacatga	aggtgaataa
92941	tcaaggtttg	ctggcaagtg	gctgagtttg	tatttgaaac	tgtctctcga	tacaaaacc
93001	catgtctctc	ctacgaagta	atttttctcc	attgggggaa	ttcttcaata	atgcaacaar
93061	tgcacatttt	ctcttgttca	tccaatatag	aaacattgtg	ttccttaatt	ttcttttagt
93121	ataatgatta	taataataac	aataaaaaac	taaacaggag	aatcgcttga	acctggggag
93181	tggaggtttg	agtgagccaa	gatctctcca	ttgcactcca	gctctggcaa	caagagcaaa
93241	actccgtctc	aataataaac	aataataaaa	taaatacata	aataaaaaat	aaagtgtttt
93301	ttcaaaagga	cagaatgtta	agagagggat	atttagttgc	ttgacatttt	actcgtcttg
93361	ctttttattc	tagaatctga	cagattacaa	gagactttga	actggctcca	aggatctctc
93421	tagctctact	gactctaacc	tcaccacaag	agatgtgatt	atgactgtgt	actcttttta
93481	attcaattca	gaatccccag	tggttaccgc	ctgactatag	ccgagattgc	tcatttatga
93541	tgctattttg	tgctcattat	ccagggaagg	gttataagat	attagaagga	ttcttgagg
93601	attgttctct	ttagtgttaag	gttaaggggt	taattgaaca	tcggataatc	tcttgagctc
93661	gactcaaaat	aaagttttca	agtcctcata	ccaatagctc	tcaaatattc	ttcttaagct
93721	cgctctctct	aactccttga	tataaaccta	tcctttattt	ttatgtactt	ataatttttt
93781	ccattagaaa	tggaaatcagt	tcagaatgca	taaaagctga	tattttaagag	ctcaagataa
93841	atgaagcctt	ttccttctgc	ttcagtgaat	ttattaattc	agctcttcat	gttccataaa
93901	ttgtcactga	tttagtaatt	tgtatgaaac	atttatatac	aaatatccca	ttcttaataa
93961	agcctataga	taccaagaag	tttactcaag	catagataga	gtcttagaat	aaaacactct
94021	gaatacacac	agaatgaata	gatataagaa	tataatagaa	agcactttat	actcgaggag
94081	tttgatgata	tatgtccctg	gagacaaaa	tgtattagaa	tcaccttctc	tcacactctg
94141	tttatttcaa	agacttttca	tatatgtacat	tgctttttat	tgcagtgttt	atgcttaaat
94201	ttactcccat	tattctttta	gttactttac	tattttattg	tttaaaaaaa	gagttgaaat
94261	ctgtggcgta	aataaactat	tgcaagcctt	cacaaagttc	taaaccttcc	tgactctttt
94321	agtaactgat	ttactctaga	tagttgcttt	ctatgtagct	attcttctat	aggaagcat
94381	tttaaaaaaa	tttttgtcat	tcocaaagaa	atttttccat	aattgaggca	ctctcatcat
94441	aggataatga	acatagtatt	ttagtattga	ttaatgtcat	cgctaactct	ttcccttttc
94501	tcagcagcat	ttattgagca	gatattgggt	gaagtgtact	atcacaggtc	ttcttaggac
94561	aggagtgtct	tcattttcat	tcattccaaa	ataatttgaa	acttcaattt	tgttatttcc
94621	ttatccaatg	aattattttg	aagtgcata	aaatatctag	ctgtctgggt	tcctttttaa
94681	aaaaaattct	aatttttaaa	tattgtgctt	agtttaagtag	tttatatata	catattttaa
94741	attttgtcgt	aatttcccta	gtggcttcta	taagagcaNt	tttttttgtt	acatgtttat
94801	aagtaaaact	tgatttctca	gttagtgata	agttctatgt	atatcttata	ggataacctt
94861	gtttaatttta	tatttaataa	ctctatatatt	tattcatag	tatatcatag	tagcagactg
94921	taacagacca	ctatgatgtg	atgtgtattt	gttaattttc	ttttgtgatt	ttacttaact
94981	tttaggttgt	tcaaaatgat	attgagggat	tttaggttca	tgatcatatt	tttctagctg
95041	taaaattatt	gacataatga	aatgtcctgt	tttgatactt	tttaatgttt	gactttcaat
95101	ctcattttgt	gtctactga	tggtgtcgtt	cccatctcac	tgtagtacc	ctgcaggtgt
95161	agggcttcaa	acttggaaac	atcatggttt	tggtctctc	cagtaagcag	actctagccg
95221	gactcttcaa	aattccaacct	gatattttac	gtcttttgaa	acaaattttc	cccatcttat
95281	tttatttttt	tatttttttt	gtgagacaga	gtctctctct	gttgcccagg	ctggagtgca
95341	gtggcacgat	ctggcgccac	tgacagYtct	gcctcctggg	tgcaagccat	attttatggt
95401	attaaaaata	tatttttaaa	ctactcctg	ccatcttatt	ttgtgttttc	attttaacct
95461	tccttttctt	ctgtttttct	tggttccctt	tcocagcctt	ttcaggattt	ttttatgctt
95521	cttttgttcc	acttttcatg	tactgttttg	aaaactata	ttctcttcta	ttctccaggt
95581	ggttatatta	acttttttagt	cacaagtggt	tgaatttgta	ttttctaaat	gtatctataa
95641	tcactgtcca	ttgtcccttt	ttgatgaacc	ttagaatgct	tttttcccta	aatttttcat
95701	cagcacctac	acttctattt	tcacacaacc	atgttgaaat	aaacttgaa	tttgcacaca
95761	gagtatttat	taaatatagt	tttgcaatta	tatttcatag	aaaaatagat	ttttgctttt
95821	ctttgtcaat	cactgcagct	cctYgtgagg	tcctgatttc	ttttcttttg	tatttctctc
95881	agtagtagtt	tcagctttca	gagagattct	gctgtgttat	taaaactctg	attggggggc
95941	chRgcgcgtg	gtctatgcct	ataatccag	cactctggga	ggccgaggtg	ggttgaaatc
96001	gaggtcagga	gatcgagatc	actcctggta	acatgcgcaa	accgcgtttc	tactaaaaat
96061	acaaaaaata	tagccaggcg	tggtgtgtgg	ccagcttagt	ccagcttagt	ggggaggctg
96121	aggcaggaga	atggcgtgaa	ccggggaggc	agagcttcca	gtgagccgag	actcgcccaa
96181	tgcaactccag	ctggggcaac	tgagcaagac	tcacatccaa	aaaaaataaa	taaaataatt
96241	taaaaaataa	aaaaaataaa	aactctgaat	ccctggaatg	ttgaaaaaca	ctctttttct
96301	tcctcacata	ttaattgatatt	tttgctctgac	aatagaattt	tggattttgaa	ttctttttta

96361 ttcagcaaac tgaaggatt gctccaatgt cttttcttca tccaatatta tctatgaaaa
96421 atctatgcca aatttgatta gaattactat aaacaactct tttttcacrc tctctgaaat
96481 cctccaatagt tactcttttat actttatagct ttttaacatat tgactatatac ctttaagtctc
96541 tgaattctca ttacatttgt acagatgtgg ggccttttgt ttttgtgag ttcttgtttg
96601 tttaaatcct gctctgtgggt tgggtgaactg tttccatttg aggccttata tttttcttca
96661 ctataaagaa attocatcct attatttctt cagattttac ttccctttat tttttcttca
96721 tagctattag ctagaagtta tgacttaaca gaactctctt ccaagtcttt taagttttca
96781 actttttttg tccactgtgt ctacattcct acgtttgtgt tctatatac caaatccctc
96841 tttcagctgt tctcattttt ctatttgcac ctactgaatt tttYatttta ataatattcat
96901 tttttaaat tccaggggtt tgacttttgt ttgttttRtc acagatagct ccttatttgt
96961 tattttgtat ccatataata tttgaagaca cttaataagc tcttaagaaa aagtcctttt
97021 ctatcatctc attaaatttt tcaaaagttgt aattctgttg ggcctgtata tatatttttt
97081 tatggagcgt gcatgctaaa tatgtttgat tcttgactgt aggcctatct tgggtatttg
97141 aattcccctc tagactcctt atgctttcac tcccaagcc agcctttagg gaggataga
97201 aacagctttt gaggttttgt ctcctcactg ttttcagtga gaattgagga actttgagat
97261 ggggtattgt gaccctgccc ctcatcttta ggctggctcc tatgcaagaa cagacttga
97321 ctggttagaga ggttaagagt gggatgtaca tggcatgacc agagtggatg cctcaactca
97381 tttttctatg atttgcccta gcttccacct cctgtctagt cctaccctct accagtctca
97441 agcatgggca cccctgggrga tgcctccctg tttctgggca ggcatttcta aaagttttca
97501 gtacaaactc cagactacaa ttaactctctg caaacagcct gtgtactttt agactttctg
97561 gggatttctca tcaattttgat tagccaaaaa tctctttgaa ttttagaaaa aggcataaga
97621 ttcataRact taataaataa ctttaaggctt agagtgaag gacagaagct gaaagaagac
97681 aggatatacat cgtgcaarta gtgttccact ttgaaagta aaagctccat ttatattttg
97741 tgttgtttcc cttttgtatt gatattaggg ataactRgca atgttcaact attttgcaac
97801 tactttgtac atgtgctctt aaatttcat tcaagtatct tcagagacac agatgtttta
97861 cattttaagt Mggacaaatc ttttcatttt tcaatttaag atttctgtgt gttgtgtcat
97921 gctcatggag cctttttact ccaacaattt aaaagtttcc tgtatttact tctgaaattt
97981 catggttccg tctttcatat ttagatattt catgttcaga tatagatcta tggagacttt
98041 agttttcgtt ttgaggtgag gtttctgtgt ttttccact tcccttttct atataggagt
98101 tttttattga cgtgttctac gtgtccacta atttgttttg ggtgggtaga tgtagaagag
98161 catttaacat gtttacttga tagttcatca aatcataaca aaccacatcc atatttgtatg
98221 tacgggaagt tgcagccctg agttcttgac ttttgagatg agtttcagtta cgtcctggg
98281 tttgggggtca tctccctttg gggaaagatg agtgtgaaga agagtatgtg aagatataata
98341 gtgcccagag aagctgactg tggcagagag cacaaaagtgt cccacaaaac atttcttccat
98401 tttcccttcc gggcacacag ctagagtcca tctccctgtc tcttccagtt aggttagagcc
98461 aggcgactaa gttctttttg gtgcagtgct aacagccatg cttggccagc ccatagaagc
98521 ctctgtatgt acttcatcct ttttgaaggc tggatgtagt tgaagagttt ctaagagagc
98581 gggccaggag atgccagggt tctttaaagac atgaaagact gcatggggga cttgaaagtt
98641 gctgtgtgaa tgttttgctt tgaacttaca ctcaagtgag aaataagcct ctgaaagatt
98701 cagtttgctt tagttttttt tttttttttt tttttttttt tttttttttt tctgctctgtc
98761 tccaggctgt gagtgcagtgt gtgcgactgt ggcctcactgc aagctccgcc tccagggttc
98821 acgccattct cctgcctcag cctcccaggg agcggggact acagcgcccc gccacacagc
98881 cggcgtaact ttttgtattt ttggtataga cgggggttca cctgttttag caggatagtc
98941 tgcactctct gacctgtga tccgcccgc cgggctccc aaagtgtgtg gattacaggc
99001 gtacagccacc gcgcccggcc cgagatatgc tttttgagt aagaagattc cttttatttc
99061 taacttaccac agtggtcttg ttgttgtttt aatcagaagt gagtgtttaa ttttatttga
99121 gatttttaca cctgttaact atatacataa tagagtctct gctgttcccc ttaaatctct
99181 aattccaatt attacatata tagagtctct aaagttagaa tatattttaa tatgacccta
99241 agatgtgatt ctttttaatgc aatgctggac ttcaattttg ttataatttt ttgtgtattt
99301 caagctgttct atgattttat agttttcttt tttactctat tttactccag ttttgtactc
99361 gagtttatgc tagatgcaaa ctgagaagtt tatcagcttt tctctttaat ttttaacatt
99421 atataatcat gagtattatc ggcctcatgc ccttttgagg acatgtatat ataratatat
99481 atattttacta tggttctaat tctctctagt gtttatggat tatctactct ttttactaaa
99541 atttgttaata ttgtttatgt cccctctctt aatttataatt ttgtttaaatt ttaataatt
99601 ttcagtggtt atatcagttt ttaatttctc gccatgcact gctcttattt atacagttt
99661 ctRaggctct atgtattgtc aaagaatgtg agttttgtat tcaaatattt accattttct
99721 aacttatatta tttttgcttt tatttttatt tctttctctc gcttctattt atgtatttt
99781 gtttttctct tcttaatact tgaagggttg tttttttttt ttattttttt atttttttt
99841 ggggctataa agttttctat atttcacaa gttttgatata taataatctt tctaatgtt

ILIRL2 genomic sequence (SEQ ID NO: 2)

>2:102409301-102505350

1	ttgtgttcac	caataggaaa	tagttaatca	tagtgatat	gtattatgga	atgctaagca
61	gccatgacag	agtctatttt	ggaagacaaa	tcatgtgggc	ccaaattccc	aatccacagt
121	aattacaaaa	tagtagggca	aaagacccca	tttcaaaaaa	tcacatggtt	cacagagaag
181	ataaggaatg	agacgcataa	ggttactaat	gggtggtttc	gctgktgggt	gggtttagggt
241	taattttctct	ttttctttgt	gcattctcat	atctaaaaat	tttaattcaat	agccatttat
301	taactctagat	agatcagaaa	aaatcaatta	atgttaagat	taaaaaaca	ttctttcgac
361	gatccacgat	acaattgatc	tgtaatgtca	ccggccaggt	gagtgacatt	gcttactgga
421	agtggaatgg	gtcagtaatt	gatgaagatg	acccagtgct	aggggaagac	tattacaggt
481	atgtatgcta	agagttatct	acatttttgr	gttaaatccc	acgtgatatt	tatatatacc
541	ttgtcgggtc	agtttaaaag	caagtggttag	ttgctcctaa	cctttgctgc	tttttttttt
601	tttttttttt	tttttttgcta	agctaagtag	aatttataag	atcttgtaca	tttaaggtaa
661	aaaatactgt	tcaattgtggt	gcaaaattaca	gaccacttag	aagcctttct	ctcagtgat
721	acatgttgca	acatttcaac	gaagcaatta	tctttcatta	tcttctcatat	tcttcaagta
781	gcttagaaga	gactcattaa	tgagctcaag	aatcaggcaa	tcactgcttc	tcgaagcct
841	ctactgtggt	cctactgctY	atctatggga	caaRgatctc	ctggcttccc	atgacctctc
901	cttcacaaac	ctgcacaaagc	actttgtcat	ctgcccacRt	ctcctcttgt	ttagtgtctc
961	ctctgtgcc	catggagaac	acaatgcatt	tgtctacatt	ttcttcttgt	gaagtggtaa
1021	tttttttgtct	ttctctgcta	ctgagcctgt	tactgacagt	ggcttttggg	tataaaact
1081	tcagatagat	gttgccagca	gtctgaatgt	tgtgactgtg	atggggcagg	gtgattat
1141	cagtggaact	ttgttcacaa	ataaggaat	acacagggtg	tacaggtctt	atttgttagt
1201	gatgcaattc	acttacacaa	gtttatttac	tctctctctc	gaatagtggt	gaaattcctg
1261	caaacaaaag	aaggagtagc	ctcatcacag	tgtttaatat	atcggaattt	gaaagttagt
1321	ttataaaaaa	tccattttacc	tgttttgcca	agaatacaca	tggtatagat	cagcagatata
1381	tccagttaat	atataccaggt	aaacacaaaa	ctaattgaaa	tcgactgttt	ttttactgtc
1441	gtgaagattcc	atgactttga	agtttgaaat	gccatttctc	ctKcttagaa	caagctttac
1501	ttctctcaata	cttgggttaac	tctattttct	tttttactct	tctgtcgaa	ctctctctct
1561	tgggaagcttt	ttctgtcctgc	tgccctgccct	taaccagctg	ctcgcccaag	agagagggagg
1621	ttagggcctc	tgtagtact	tctgtagcac	catatgtcac	aggatctagt	gacttctgtc
1681	ttctgtactt	aactataaat	cttgtgatgg	tgggcaacct	ttatcttaag	aatcatctca
1741	ttctccacag	taatggcaag	ttaggtctgg	tacattgtgg	gtaccaaatg	atactacaYt
1801	atgatgcata	gggtaaagct	aaatatccac	tttcaaaagag	gaacatcagaa	gtcactgggt
1861	ttcaatgaatt	ggtataataa	aacataatat	tgaaaagtatt	tgtgaaacct	tttaagggtaa
1921	tttgtgggttt	aattaaacat	aggctattat	aattgctgtc	atgggaagaat	atctgaaaga
1981	ctctataaat	taacttctat	gtatgtttaa	atactggcag	catacaaata	gaattttaga
2041	taaaagataa	acatttatgg	tagcatcaaa	aatcatcaaa	tacttaagaa	taaatctagc
2101	aaaagcttgt	caaaacctct	gtaatacaaa	ctaaaaataa	ttagagaata	ttagagaagaa
2161	actaaatgga	aggatataca	atgttcatWg	atgaaagac	tcgatattat	gaagRtatca
2221	gtctctcccc	aaatgaatct	atggagtcca	aaaaattcca	atacaaatct	cagcagattt
2281	gtStacaagtg	agagtcagtg	tttgtagggg	tgtgtttttg	tggaacacgt	taaaaagtcaY
2341	aggggaactgt	aaaggaccac	glatagtcac	gggtgtctta	atacagaata	ttaactctgg
2401	aggatattca	ctacagacat	catgatcttg	tatgaagcga	cagtatctaa	ggccttaagt
2461	gtgaactatc	atttgccca	gtgtgatat	tgtctggaaa	agtggtatac	ttagttctctg
2521	tttatatacc	aaatcattta	gataattaga	gttaaataaa	ttttctagatt	ccctttctctg
2581	gatgttttca	catgggttct	caactactcc	gggttacttc	ttttctctcc	ctctctcttc
2641	ttctctagga	ccctcccacat	actgtctccc	actgtctccc	cagcttctct	tttaattatt
2701	ggatataacta	gtagagaagg	agggccagag	aatgtggaaa	ttgtgaaact	ccctcaagct
2761	caaccttact	gcctttccac	cagctcttaa	ctttaccaca	ttgtactctc	gaactcaggg
2821	aacttttgtta	ggccttttag	tgattttaac	ttttccctgt	tttactgtgt	aggtacatct
2881	cctgtgtgtct	tcggtattat	ttcccatgtt	attgtatatt	ttgactatta	ggtgaagact
2941	tcatagaagt	caaccttagtt	ttMtcatgtc	tttgtaccat	agatccaat	acaaaagtgat
3001	aataatgaat	gagtttaatt	ttgtctgaatg	caggccaatc	ccagatargg	gctctctcag
3061	acgaagaat	tttaatttgt	gtgctcaaa	ttttaattct	ttttgtgtct	ataattttta
3121	ctcctttttt	ttcttttttg	ctatagtca	taatttccag	aagcacaatg	ttgttatgtt
3181	tgctacgggt	acagtcataa	ttgtgtgttc	tggtttctat	tataaaattc	tcaagattgtg
3241	catgtgtgct	ttgtacaggg	attcctgcta	tgattttctt	ccaaataaag	gtataattgt
3301	gtatttccat	cagttattct	tggttgagat	aaggagtagt	taggaagatt	agaagatgac
3361	taagagggnt	tttactaaga	gggtttctaa	aatgaaga	ggcatataca	agaataactc
3421	ttattcttca	acagaattat	agttttagaa	ctcattagcg	tgaattatcat	ctgtttataa
3481	Rttctgcctc	caacattcat	attggtagaa	taaacaggta	tttagagcat	tggtttataa
3541	atccagttat	gcacaagcca	ttgKtaggcc	ttgtctctgt	atgaatagga	cagacagaga
3601	tcatacctta	atgaagaaaa	tgaatgact	agatcttcac	gcacagggaa	ggntctctct

3661 ctcctttgtt taaactttgc gaaaaaaaaa aaagggaatc cacaatatct aaaaaaaat
 3721 gaatggatag aattccaggc tgagacctct ggggaagaag agaggagac gaagacctta
 3781 aggatggctc tatactaaga gtatcaggag cagcctccaa atagaagac aaatttgcag
 3841 taaaaacaca gaaatagaaa cctgttaaga gatgaacact ttttaaggg attatatatt
 3901 tggatttgct gcttcagtcg tgccatttga taaaaaaga tgaatagatt attatgtaat
 3961 gaagtgtttg gactactgact ttatcaaatc tcttatttt cctgttggg tcttaataca
 4021 ttatgttttt ccttttagctt cagatggaaa gacctatgac gcatatatac tgtatcccaa
 4081 gactgttggg gaaggggtcta cctcgtactg tgatatttt tcttttaag tcttgcctac
 4141 ggtcttgtaa aaacagtggtg gatataagct gttcatttat ggaagggatg actcagctgg
 4201 ggaaggtatg tgtgtaatgg aacagagtaa aggcttatt gtgtaaaact acttagtaaa
 4261 atgtggattc catctttctta gaagatcgtg gcataggggt atatgtttca caatttttaag
 4321 aacctctcca gaagtgatag atgattttta catttttaa atgcatttca tctctctata
 4381 ttttgcagca gcaataattta agtgattttc attttagttt gaaaaactta atgcatagtt
 4441 aaacccaaca gttgctttac aactgatata attaaacagg agtggtagag atcaaatgat
 4501 tgaataataa gtttttaaaa ttccaacaaa gttttctgag tcttaaatag aatattttgc
 4561 ttttgggggc caatttttga gttagtctat aaaaaggag gtttcagtg gctcatgctc
 4621 tttatctcag tacaacctgc ggaggccagg gtgagagggt cacttgagcc taggaagttg
 4681 aggtctcagt gctccaagat cacgccactg cgtccagtg tgagcaacag aacagagac
 4741 tgtctcttaa aatttaattaa ttaaaacat gggaaactcc tttattttta agtaagacaa
 4801 gaaaaggaga ttggagacca ctggtttgtg aaaaagcctg tctggctttg tctcaggagR
 4861 gaatgatgat aatagaatt ttacttacta tattgtgctt cctgtttttc agacattgtt
 4921 ggggtcattt atgaaaacgt Waagaaaagc agaagctcga tttcattttt gctcMgaaag
 4981 acatcaggct tcagctggct ggggtgttca tctgaagac aatatgccat gtataatgct
 5041 cttgttcagg atggaattaa agttgtcctg cttgagctgg agaaaactca agcatctgat
 5101 aaaaagccag aatcgattaa attcattaag cagaacatcg gggctatccg cttgctcagg
 5161 gactttacac agggaccaca gcttgcaaa acaggtttct ggaagattcg agcataccac
 5221 atgccagctc agcgacggct accctcatct aacaccagat tactgtcacc aggccataag
 5281 gagaacctgc aaagagaggc tcacgtgcct ctgggttagc Rtggagaagt gccaagagt
 5341 tcttttRggt cctcctgtct tatggcgttg caggccaagt tatgcctcat gctcagttgc
 5401 agagtctcat gaatgtaact atatcatcct ttatccctga ggtcactcgg aatcagatta
 5461 ttaagggaaat aagccatgac gtcaaatgca gcccaaggca cttcagagta gagggcttgg
 5521 gaagatcttt taaaaaggca Rtaggccggg tgtgggtgct cagcctata atccagcac
 5581 tttggggagg tgaagtgggt ggtaccagag aggtcaggag ttcagagacca gctcScagcaa
 5641 catgcaaaaa ccccatctct actaaaaata caaaaatgag atggcatgg tgccacagca
 5701 ctgtaatccc agctacacct gaggctgagg caggagaatt gcttgaacgg gggagacggg
 5761 ggttgagtg agccgagttt gggccaactg actctagcct ggcaacagag caagactcca
 5821 tctcaaaaaa agggcaataa atgccctctc tgaattttt aactgcgaag aaaaaggcatg
 5881 gagacagcga actagaagaa agggcaagaa ggaatatgcc accgtctaca gatggcttag
 5941 ttaagtcact cacagcccaa gggcggggct atgccctgtc tggggaccct gttaggtcac
 6001 tgaccctKga gcgctctcc tgagaggtgc tgacagcaaa gtgagactga cactcactg
 6061 aggaaggagg acatatcttt ggagaacttt ccactcgtct gttattttca tacacatccc
 6121 cagccaggga ttagtgtccg aagaccgaat ttatttttac agagcttgaa aactcacttc
 6181 aatgaacaaa gggattctcc aggtttccaa agttttgaag tcatcttagc ttccaccagg
 6241 agggagagaa cttaaaaaag caacagtagc agggaattga tccacttctt aatgcttcc
 6301 tccctggcat gacctSctg tcttttgta ttactctga tttactgct ttggaggaac
 6361 agctccctcat tggcttctYtc cRctctgcaat gtcccttgca cagcccaaac atgaacctc
 6421 ctctcYatga tgcgcctctt ctgtcatccc gctcctgctg aaacaccttc caggggctSc
 6481 acctgtcag gaagtgaagc ccatgctttc ccaccagcat gctactccca caccaccttc
 6541 ctgcctctgc ctccagcttc cctcgctgt cctgctgtgt gaattccag gttggcgctg
 6601 tggcctatgc gctcgccccc agcaactctc tgtctctgtg Yttgctctgt ccttctctcc
 6661 tcttttgcct agggagcctt ctgcatttt ctctagctga tctRatttt accaaatttc
 6721 aqaacatcct ccaattccac agtctctggg agactcttccc taagagcgga cttactctc
 6781 agcctctctc ctctggctag gccacttgca gagatgggtg tgagcacatc tgggaggtg
 6841 gtctctctcc agctggaatt gctgctctc gaggggaggg ctaggtggc tctctctgtc
 6901 cctcaactgc ttccaggagc aatttgcaaa tgaacatag atttatgtaa tgctttatgt
 6961 ttaaaaaacat tcccaatta tcttatttaa tttttgcaat tatctataat taggacttga
 7021 agaaagtac ctatttttta aaaaaactac actctaaagt ctattgaacc caataacggt
 7081 gctctcaatt ctggcttcta gctctgggtt ctgagtactt gatttcaggt aggaagtga
 7141 cccccctcac tccacactgg cactgttttg agaagaaagt acattttgtc ttttccctag
 7201 cgaagttagg aatgctttta ttcaagacac caaattccaa acttctaaat ctctctatg
 7261 tcaaaaaatt tgtttagatt ttatgaaaaa cttcttctact ttcatctatt ttttccctag
 7321 aggcacaact tctttaaatt gtttcaattt cattaaaaa atgaaaccaa tttatagcc
 7381 accgatttga ggacacaagc acagttttaa gagtgtgat aacatggaga ggaactttgg
 7441 tttttatatt tctcgtatatt aatatgggtg aacaccaact tttatttga

7501 tctctcctaaaa caaaaacacaa ttgagtttaa gtctctgact cttgcctttc caectgcttt
7561 ctctctggccc cgctttgcctt gcttgaagga acagtgctgt tcttgagctgt gctttccaac
7621 agacagccctc tagcttttcat ttgacacaca gactacagcc agaaagcccat ggagcagagg
7681 tgtcagctgtc tgaaaaagcct attagatggt ttacaaaatt aatttttgag attattttta
7741 tctgtcatcc agaaaaatgt tcagcatgca tagtgctaa agaacagacc aatttggaaa
7801 ctgtgtttag tgacaaaatt gcccagagag tgggggtgat gatgaccaag atttgcaga
7861 agaalggcag ctggaattta aggaggagca agaatcaat galaagcgtt ggtggagaaa
7921 gatcccaaca gaaaagtga aagtatttcc ccatttcca agKgttgaa ttctggagaa
7981 gaagacacat tcttagttcc ccgtgaactt cctttgactt attgtcccca ctaaaagcaa
8041 acaaaanaact tttaatgcct tccacattaa tttagttttt ttgcagtttt tttagacata
8101 tttttttaag atgccttaag tggttgaaga gagtttgcaa atgcaacaaa atattttaatt
8161 accggttgtt aaaaactgggtt lagcacaaatt tatattttcc tctcttgccc ttctttattt
8221 gcaataaaag gtattgagcc attttttaaa tgacattttt gataaatttt ttgtgtacta
8281 gttgatgaag gagttttttt taacctgttt atataatttt gcagcagaag ccaaattttt
8341 tgtatattaa agcaccnaat tcatgtacag catgcatcac ggaatcaatg actgtactta
8401 tttttccaaa aaattttcaa actttgtact gttatcctga gaatctgttc ttgtccaggt
8461 ccacagcttta cctgcacatt tgcacattcc caggccctcaa caaggtgagg agacctctgt
8521 cagaKwgttt ttctctgtgt ggggaagcag gtgggaggag gtgaggagg agaggggagg
8581 tggaggtcag aggcatttgg ctttaacagtg agccctaact ccctctctc agactaaactc
8641 tactctccat gctcatttgc ttctaaaatg gattaaaatg tggcctgtct caatacattt
8701 ttatttaact ttcttaacatt tactatttaac ttatcacttt accgttccaa aaaaatgata
8761 agggaaattt tgtatagact ttacattttt acaaaagcgt ttattttttt cttttgaccc
8821 agaaaggtggg caaaattgggt gaacttgctgt tccaaaatgc atgtcttaaa gcttgttaac
8881 tCwgtatgct agagatgaca cccagtcagt gcctctctct tctcttcacag caatgctaag
8941 gggcaggtga ctctctcagt acctggggag aaggggcagK tggcaggttg gcttagatc
9001 tgagtccagt atgagcactg cctccaccag ctactcctgt tgcactctta gccaagtat
9061 ttgagcttcaa atttactcat tatataagta taatatctaa ctatagagt ttgaagttaa
9121 aagatttaaa atattatgac aagcctagtgt cttagcataa agcagggttct cagaaaagt
9181 ttgctttgtt agtagcaatt ctatgaattg ctatctgaa gccctactag aatctgcmaa
9241 tggaaaggggt agaggagact tataaaattag aaatgacaat tgacactaag cacaagatgac
9301 acaatgttcaa actgaagttg tataaccaca gaggccagga gccctgtcca gccaccagcc
9361 cctccactggt cccccaacct gaaagaattg ttctcactgt aagagttgac ggagctatgc
9421 accacattttt ggttatgata ccagtttaatg tgaaaaacct taggaaaaat agtctaacc
9481 accattttaaa actcacacgt ttctctctct ttatcagata aattttcccc agtaaatgca
9541 aaataggttt ttaggagagtc tctggaatta ttttacaaca ggaatgcctg ctggtggaaa
9601 aagacctgga actaaattcc tgcactgtca cagctttgaa accacaacaa agcacctggt
9661 tgtatggaa cccattttt tcatgttaa aacaggactt cctatgttac aagatgttta
9721 tatgtaggaa gtctctgttc agtatacggg atagaattct aaaaataatt ttcttagttt
9781 tatcacttga tgagtacaga taaaaacaaa aacttactca tccaaaatgt atatttttca
9841 aattctagg ttttaggtgt gtgcgggggt tggagagtga tataatgctg tggttaaatt
9901 tttaaaatga tcacagctgt tacttaattc catttttagca agtcaggatc tggtttagca
9961 ttttttaaat agtacgttcc ccaagtagta tttaagagac ttctaagat ataaacctag
10021 caattataaa atcagagatt tctccagctt tatttgtcaa aagaaaattct ttgcgcttt
10081 gcagctgagc tctggaggtg tgggtgaggtt ggcttagcgt agggcgtatg gggagcgtag
10141 caggtgggga agaatgtgga ttgggctgga agggaaaaat tgttctctgt tctaataaa
10201 aaatacatgt aatgaatcac catcatggca ataattcata aatggagtag tacaatgaaa
10261 aatgtatgtg ggaagacaga ggaaggagat aattttttga tgtgataaca tcatatttac
10321 aaccaaagat tgtgtgtgtg tgtgtggggg gggcggggtg gtttaatttt taagcattag
10381 aagagttaca ggaataggtg gtactattta aaatgagtat taatcattca aaacaaaag
10441 atgctcatct taccacatgc cgctcaggtt tctctgaa agaggtctgc tgcctaaagt
10501 acgttaatac tacctatacc ttaaatctga gccccaacaa cttagcacagc agtctctcaa
10561 aatttgcagc tgttagacca gttgagcctg taccacagc cctgagactg atagaggtct
10621 gttagacatct cttaaagctgt gttcaaccag ttgagagatt aattttacct cagggtgaag
10681 ttgatgaagc ttgtttttct tagaaccttt gacttgaag gacttgaagc tgcattttat
10741 ctctctctctc cgggtctggg aaggctacaa tgataccatt ttcttaggc ctacaggttt cattgtttt
10801 cctgtcaact tacaatcct gaggaatgaga ttcttaggc tctctaggt ttaactcttc
10861 gcatgtttca cagcctgtgt ggggacccac tctctgtttg gttcatgtg ttaactcttc
10921 cctggtcaac actacatttt cctccacag ccattgtacg tcaacttacc tgttagcca
10981 gggcagagct gcagcttctc atttgccttc aaggctgtat acacagcaca tctgtttcaa
11041 cagtttttgt gctcttctca aaactggacc cgttctctg tattccgtag cactgtgct
11101 ctgaattctt gtcttctcta aaactggacc cgttctctc ctcaaattca aaaaacagc
11161 ggaattattt gttgtctcaa cgttactttt aggttaagaaa aaacagaatt atagtcaga
11221 aacattatgc tagacactga gaaaattaca aacaaatctc atatgcaga gggctttaa
11281 aagaagatg tgaaagagaa gttgttcagg atatgcaga gggctttaa

11341 cccattgactg aactatttgg actttaccac taggagtagtg tatattgggag atattggagg
 11401 caacaggtgct gaagaaacttt cgacataaag aaacacattg ataggggact attgtacagg
 11461 agatttgggag gaggtaaaag gttacatagg gaggttgtaa ggaaggtggt agagataacc
 11521 ccttggggag caattatatt taagacatttt tataaaaaaa attgagagaa actctctttt
 11581 attacagaaag caataatggt ttgagagaat gtggaaattt ctaaaacata taaggaaaga
 11641 aaatgtccac cataacttca caacctaaag ataattattg atattttata acttttctat
 11701 ggatataact gagaccarat aatcacatgga gtttaacact ctttttaaaa cttagcatac
 11761 attatttggcc acattactat tatacgaat acaatctata agtagtgact aagttcatac
 11821 aatggtgtggt ccaataatctg atagcttttgc tgccctcagt ggacactccag attatttcta
 11881 gcttttagtca tccagtagtca aagtgcataa gttatccttt tcaaaatttt tttacttctg
 11941 taactcatttg ctttagcatat attcagaggg caagattcct tttaggttcc ttgtagttcc
 12001 atagagacat ttgctcctct tacacaagca gtgtgtggca ctgagaatcc acttalttaa
 12061 atcatttgcta atttgataga caaaaaaagg ttatcctttg ccagtttaact atttaacatg
 12121 ttgaatgttt cacttaacaa ttacaattgg aggcgggttg atcacttgaa gccaggagtt
 12181 tgagaccagc ctggtcaaca tgggtgaatg aaacccctac tctacccaaa acacacaaaa
 12241 agcaaaaaac aaaaattacc tgggctggtt ggtgcacgcc tghtatccca gctactaagg
 12301 aggtctaggc agctgaggct attggcttgc tctgtgtrtt tttatttttg aatttcaaaa
 12361 ctgttttctc atttgtgatt ttgcactagc tgtttcctac tttggggaaa gccctctctg
 12421 cagacctcca catgctggac tcttgccttt gacaagggcc tctgtctgac catagtccct
 12481 tctgaaggga ggaacttccc aacacctct cctacacttc atcataatgt ctttcagggt
 12541 tctcaccagc ctgaaatcat ccttcaaaa ttcttatttt acttgacact agaatgactg
 12601 taaactctaa gagggtctgt cttctgtaca gctgtatttc tggcactcag aatacactcc
 12661 ggaacacaggt ggaactgtta taaatatttg atgagggact gagggaacta atgagtggag
 12721 ctctgaggag tgagtattta agccaggac tgcagaaac caagtgtctt aggaacctcc
 12781 tctcagcttc cctgctctgt cttcctattt ctagaagctc atttctccc aacataagca
 12841 gctctgtaca gaaatgctgc tatataattc tgcagaaac caagctcat agggggaaa
 12901 taaggctttt aaaggataaa agatcttgggt ggagcccaaa acacccaccc cagcttaata
 12961 ctgggttttg aaaggtttaa ttgtgtcgtg tgaatatatt tctgttttct tctcattggg
 13021 aaacattatc tgtgggatatt ggccaatggg aaataatcag atatttagtt agcaacataa
 13081 aaaggtagta tgcatcatgt aaaaataaaa ttgttatatg aaatcctttaa tccaatttgt
 13141 tgccctccta ccttctctgaa tagccgtcat atcctagtct gagggtcaaa tagactgaag
 13201 tgaataatca accaagcaga attctgtaat gctttcaaca cacacagatt ttgtgtcttg
 13261 tgctctgctc cagaatgaag tgatgaatct ctagaagaa ttgatttact catataaaaa
 13321 aaaaaccaac tgaaatttat ttccatggc cactgactaa tgcctagaaa catataagat
 13381 attccattg aaaaaatc tgcaagtggg agagaattag acaaggagggt gtgttagagg
 13441 ggtgtgtgat aagcatctat tcatattat acacctgtt atggaggctt tacaactgcc
 13501 acctctgaaa actgggcata acctctcaat cttaattgat ataaaaataa atcacaggat
 13561 agctttttaca tcaagcMgc aaaaactggca aaatttataaa gtctgacatt accaaattt
 13621 ggtagaaca tgaagcaatg aaattctttt cctctaaagg acatagctat ggaaaaaaat
 13681 tagggctttt ctaatacaat tgaggatgta cctaccaaat gattctgcaa ttccgttcc
 13741 taaatggcct ctgaaatact cgcacaaaag gacattacca gaattcttgc agcagaccgc
 13801 tttataagag caaaataaaa atttggaaaaa acttaaatgt tgaagaggaa tgaatacat
 13861 taagtttttt tttttcaagg taattgagaa cctgcagtaa atattatggt tctcgttat
 13921 ttttaattgc taagtttaca ataccggaa tcaagtctgc cttcaaaagg ttcgttttca
 13981 ttccacagta tcaggaaaaca catttggcat agagaccatc ccaggaaagt aaatttcaga
 14041 tcttcagaa tagtagcaaa gtccaatgtc agaagtgtcc agtgagagtc actgcagggg
 14101 actgggtagt cctgtcttaa cttcatatat ttggggcaa caatacccat atctcaaaag
 14161 atataacta gtctcaggc taagaaaataa gatagacac ttaacacact atctcaaaag
 14221 tgaaaatgaa aaaagatagc ataaagattt agaaaactct ttaacacact ctcatagaaa
 14281 taattctgaa tgcaaatcat atgaacttta taaaatagtt aacactttt ttgtgtttt
 14341 gatgaggaca taaacgctga agaatataca tatacagagg aacctgttt atctgctgata
 14401 gtgggggaaa taaataataa tctctattta tagcttaaga agagggtcct caaagaggtt
 14461 agccctatgt ggtccctgag agaccttca aaaaagattc tgaattcaaa actagtctca
 14521 tcttaattat aagaccttat attctttttt tattctcatt tctctattg tctgtgtg
 14581 acctttttag aagcttatat acatattata tcatgcacct tcaaaagagt gatttgcaga
 14641 gaactccagtc atcttctagt aagccagaca tcaaaagagt ctgactcatg tagaacaat
 14701 gccgtctttc tcaataagcc tgttttagaa agtagagtta tttttcataa attgtatgat
 14761 atttttgctta acatgtaatg ggttttaatt cacttaataa agaaagataa cgtttaaaaa
 14821 tcttcccttt aacttctaat gtagtaatat tgacaggcat aacctacata gacaaaagca
 14881 ctttgtaatc tcaataact ttaagagtg tttaagagtg taagaaatcta caaacactg
 14941 tatcacagga agcttgctta tttagcaaat tattgcatct ctgtcctcat aattctgttt
 15001 gttcactgt cctgtatct tcaaaagacc gtctgaccat ctgtgagagt taactgtttg
 15061 atggagatca cattttgaac cttttctac aactcagtc cctgtggagt gaactctggg
 15121 tgtctctga tggttagggc acagggtccc tgttgacac cccttatcgg gaagttttag

15181 acagggaacag tcttcaggct ctgaagtact tgaacaccaa gggattctgt ccttacagaa
15241 gtttaagtacg acgactcagg cagattcata atttccctta agggattgctt gggattgctt
15301 ccaattttggg gtcaattccac ataggccaat gcagagcatg cagtaactgc tcaaataggaa
15361 tttggaaagg aatgaataat tcaattlagac gtltcaacttg taataacttt aagcagacac
15421 tctgtgtgat gaaggactta gatgccagaa aatcaggctc aaagactttc aagccacttc
15481 ctactgtgat gtccatttcc ttccactgcct ccaactggga aggcaggttag gcccccacca
15541 cgggtggcggg gaaataacctt ggcattggaag tggcatgaca ggcctcgtgt cccctgtcata
15601 ttttccactc ttcacagaggt cctgcgcgct tcaatcctgc aggcaggtcc acaccggggc
15661 ggaggctcgg gtgagccagg catgggtggg gccctgacag taggagaaglt gtgcaggaaa
15721 agagctggga acaatgtgtg ccaccgcaag ccagggaatca gggcccccac agccgccccc
15781 gaccggctag gtgaccatgg gggagccagc tccgttctct ggtcgaggaag tggagctcgc
15841 ggctattttc agctccagcg gctccctgcc ttccctttct ctttcccgct ggccttgcg
15901 aggtaggcct gccctggcgt ctccccagt agcgggtgt tggggtttct gttttagaccg
15961 ccaggctcgg gtggatcccg aggaacacag gcgcagggg agcctccagt gcccgcgagc
16021 ggggtttggg tcccacgtct ggaaccagg ccgcaggtgt cgcgtggggg gccctctggc
16081 ggctattttc agctggacac cagcctgctt cgcgtcagc tggcagaagc agcttccagc
16141 Mggtccccc gcgccggccc gcctactcct cgccttccct cctctgcggc gggcgagct
16201 cccctgccct gactcctggc gggggcccag acgaaggaga caggggaggtc cggctatttg
16261 gggaaaacgt gccgccaaagt cggagggtct cccagaaaaa agggaaagltc agccgctgg
16321 ggcgttgtgt ttgagattcc gaggctgcgc acgcgcggcc ctccggccct cctactggg
16381 tctctccctc ccacccctct ctcccttctc tgcagccggg tttggggatg tggctcttgc
16441 tgccttgcgg gtgttccatc gcccttccac tglctgtcac agcaggtacg tttcgtgtgt
16501 cctccgttcc cagaggctgc ccgagttcac aggcctcctg cctgtacttg gggcccccg
16561 gggatcgctt gaccccgagc cgcgctcctt cccctcccca gaccgcaggt cggacttccg
16621 cggaaagagg aacagagaac cNgtccacg tgcctggatg ctacagccctt aatgtccct
16681 tttgagctgt aggtgacttc ggggagggga aggagttagg caaatccaa gtgaagactt
16741 agttaacaa gtccaaatgg aattactaca ggctatttta taagataaag cgttatttta
16801 tgacacaggg tgaagcaag gaaaccgtca atagaaacaa tttcttctaa gaaatttgg
16861 atggccgggg cagtggtctc atgcctgtaa tcccatgtac tgggagagcc aaggccggcg
16921 gatcacaggg Ycaggagatc tagaccatcc tggctaacac ggtgaaaccc gctcttact
16981 aaaaaatcat taaaaaaatt agcYggcgRY ggtggcgggc gctcttagtc ccagctactc
17041 aagaggtgtg gccaggagaa tggcgtgaac tccggagggc gacgttgcaq tagcctggaga
17101 tttgagcact gcactccagc ctgggcccaga gagagagact ccgttctcaa aaaaaaaa
17161 aaaggaaatt tggtagaaat gaactttaaa agtgaaccaa attttttttc ttaaacattc
17221 gttttgggat gaaataacct ttaactcaaga cagagtaaaa taactgggtg gcagagcaga
17281 aacagaaaaa acaagaaggg ttgatttact ctgtaggtga gtacagagta gtacactctg
17341 tggatgaaaa gaactaaggg tcttagaata gaagggaag agggaaatca ctccccatgg
17401 ggagggttgt gaggagggaa cggagtaaat tctgtttat ggatacat ttaagaacttg
17461 gaattatact ttaatactag caggctattt tttagaaaat tccagactca agaaactccc
17521 aataaaaaat tcaaatggc tggaaaattg aagaggcatt taaaaaaat cactagtaaat
17581 aaaaactgaa ttttcttca tggataattg tttgttttg ttttcttct cctagatgga
17641 tgcaggaggg tttttatgaa aatagagata ctctcagcaa gccagccttt cgtttttaa
17701 gtgacattcc ctccccaac atctggggaa tgcagtgtaa catggtataa aatttctagc
17761 aaaaatccag gtccccaaat catcagctc agaattcacc aggcagagac ttgtttatg
17821 tttctcccca tggaaatggg ggactcagga gtctaccaat gtgtataaaa taagtcttct
17881 aattttaaatt agaaactaat cgtgtgtgta tgtataaatt attttaggaa aattcttaa
17941 gaacataaga aactcttgag aagaattatg ttgtttagt tttttataat tgcacaaaga
18001 caatttccag tgaacacatt ttaaacaga acagatttgt aaaaactttt agtctctg
18061 tatgcatctt tccctatgga aatggcactc cagacagagc ccaactcaaa agtgtttt
18121 tccagactatt attgctgcca tcttttctt cgttttctt cctgttctt cagttgttt
18181 tcttttttat tttttgagat ggagtctcgc tccgtcaca ggcctggagt gatctcctg
18241 gatctcggct cactgcaacc tccgcctccc aggttcaagt gattctcctg tagctggagt
18301 cgaagtactt gggattatag cgccttggtt tttagtagat atgggggtt ctaatggcga
18361 agccacatct ctggctaatt tttttgatt tttagtagat atgggggtt accgtgtct
18421 ctgagatgat ctgagactac tgaactcgtg atccgcctgt ctctggctcc caaagtgtg
18481 ggattacagg cctgagccac ctgagccggc cgtgcctacc tttcttgaat tgcacaaag
18541 tttgtggga aatggcacat caagatagga atgagctccc tatgagcgt tttcacagg
18601 aactctgctga aggcagggag taagcatgga gtatgttcca gacctcact gagaacctgt
18661 cctaagaana atgaataaca caggcctgct ggtgactgtg gtcagctgga aaRcacatgt
18721 ccctcaaaag tagctgtcta ttcaggtcaa gccactctc tcaatttata agggaaatg
18781 gaaatcgaaa tttgtgtgt caacttttta taattttga atgtttgtg gccctgaata
18841 aaacacatct ctRgaacaaa tttagctcta gggcccaatt tctgtatgt cccacactgt
18901 ctgtcatgac cttaacaaat tactgtatct ctctgagcct tgggttttt ctgtaaaagt
18961 gaagtaatgc tggcctgata ggccttaggt ttagatcag tgaagtag

19021 gtaactccatt cctcgcctct tgttttgatt ccgcgatatt tgccagccccc ttctctgtgc
19081 ccagcatgcg cctctgccca ctctgattgc tgcctagattc ctactttcta aaaccagacg
19141 agactaaattg cacaataattg agtggtttcag aagtggaagt ggtcgtttagc ctctcgtcgc
19201 cctttttccac agattttagtt gclaaataaac cgtcaggggc acgtggagggt ctgctgtccct
19261 atttttagctat aggcgtgtgaa ttatttaacta gtacgcttagc ctgtgaattat taacttaaac
19321 ttgaagatca tacatcacatc aaatgaatct ggaatgtcgaa gctagactta taactatgag
19381 attctggggag tgtgaaatga gaaaaagtaa tcttttaata aaattgcgca agatattatc
19441 tgccatgaaa gaaaatgaac atgaattctc caagactttt attactaaca tccagatagg
19501 atactgttttt aggaaactgt atatttttacc tttttgcttt gaaataattt taaattttaa
19561 taaatttttgc aggaatagta tcaagaacctt cclctaccce ttatctaga ttctcgtctt
19621 ttaagaatat attttttacat ttatttctata atttttctct tcacaaataa targataata
19681 attacaaaaca atatttttct cctaaacccat tttttaaacc atttcagttgt aaaaaactga
19741 atactgcctt agcccttaat catcataccc tcttagccct taatatttca atgttatatt
19801 cctatcaaca gtgtatgttt cctatttctct ttcaatgtat atttatttat tcttatcata
19861 atcatagtat agttatcaaa ttcaggaaac ttaaaacatca tataatacct taactataa
19921 tctatatctt aatctttatca atgatctcat tgaagacctt ttaaatgttt ttcttctctt
19981 ttccagtagca gttaccaatc tgggtagcat catgtcattt ggttgcctag aatatattat
20041 tcttttttaat ctggaaacagt tccctagctct ttgtttttca tgaatactgac attttttaat
20101 actgtaagaca attattttgt attacctctct tcaattggggt ttgtcagtaga ttctctctag
20161 agtaggtttca gccatttttg ctggaatgct aggtgaggct tctgtctctc tccagaattg
20221 tactcagagg cacatggcgt ccaacttgccc ctagtgtgtg atgtccattt tgcatactca
20281 gttaaaggtgt gtctcagttc ctccactgta tgaataccat ttgtcccttt tgcgatgaac
20341 atttgtggat gctttagtct ttgttagagg cagaggggtt gcacagtgct gtgaaaattg
20401 ttgtgaaaca ttgaaaaatg agtggaaata ttgtattttg ttgattgttt ttctctctat
20461 atgaggtcttc aatctgtctt acaggggttag agacagctgt cctagaaatc atgttaacct
20521 aactgttttt gaaaaaacat ggtgtgacac ttccataggt ggtttaccac attttctcat
20581 tgagtcaaac caaatattac atcttgaaa agatgatagt ctccacatgt atcttgcaact
20641 cccgaaggtg tgtgttttg gtccaataaa gtgtgtataa gtaaaaaaga attttcttat
20701 tgatattttt cctccttttc tttaaaaccc actgtttttt atagtttaag ttgtattttt
20761 taaggacgaa ttgttaaaga aaRttgtgtg cctaagatag attagttagc tagcagtac
20821 tgataacgtt accctcctaa ttactgtttt taacatattt ttgttattat agctttgtaa
20881 tatttttata ttgtgatcca ccaaccttct ccagttatc ttatttttca gctttttctt
20941 tatttttcta acattaatta tattttgtta aatgcatact atgtgcacat ggttcaataa
21001 tcaaaaattc taagaggtca cccctggtaa aacctcttcc ctgtccactg tccatatttg
21061 ttctgggctc atcacacctt cctcaactgt ggctaccatg attagtcccc agcccttctc
21121 cttgtatgat gctatactag caaataaaaa tatatagtct agctcctttc agcccttctc
21181 tttttacgct catctttctg cacttttgtt ttctactctc aaaagtcttc ttctcttgat
21241 gatcctggca tatgttgaca tagaaggtaa ctcttggcat ggaggagcac aggcctagca
21301 tttagattg gaattagtt ttctcgtgtg tttaaYgctg ccagacacac cctctgggtc
21361 atgagttttc ttatgggaa gattttcatc tattgtattca atttctttaa tgggtgaaaga
21421 attacgcmaa ttctttactt tctcttgtgt gagttttgta agatttttag tcttaggaag
21481 ttctctattc cattaaaggt ctcatatatt ctggaaaatt gtttagagc tattctcttt
21541 taagtctcgt agacatcaaa acctcaag taaggttcaac cttcagtcat tatctatct
21601 ctctcacaca catcacaca cagctgcaca cacacacaca ctctactgat tagttttctc
21661 agagactgt cagttctagt actcttttca aaagctaact ttgtactttt tgaatccctt
21721 ctgttatgt atttcatgtc atttagttgt tttagtttcc cctctttaca agctgtgtg
21781 aagtgagttg ccttataact gtatttttaag gcacgtttgc cagtgaatgc attcctttaa
21841 gactactagc cctagaattg ctcaatttga atgaacaaa gggcatgcag atgaacaaa
21901 tgttgatgtt acacaaattg ctccacagaa ttgttagta gtttatact ttgcaggag
21961 taatttatatt tactttatatt tatgacagag tctcaactgt ttgtccaggc ttgaactcag
22021 tgggtgtgatc atggctcaat gcagcctaatt tctgtggctc aagtggaagc caggttaatt
22081 tttaaaattt ttgtgtgac agaactcttg tatgatgcc agactgtgt cgaactcctg
22141 gcctcaagtg gtccctcaggc cttggcctcc taatctagat ttgggtataa atgtaccttt
22201 catgcattgc tcaccaggag tatcttagat tctctacaa cctctggtga attctgtatt
22261 ataaagcKtt gattttttaa atcaRtttgg ttgggtataa atgtaccttt ttattttatt
22321 tgccttttcc ttaattatta gtgagattga ttgtgtatat ttctattttt atgtttcatg
22381 gatcctcttc tgaactgccc actcatatct ttattttata tatctctgtt atgttgttt
22441 coatttttct gtgacttata ggagattttt aagataaac tatcatata aaatgcagaa
22501 gcaatgattt aaaaaaaccc cttttcatgt atgaataagc taacaccttt aattaccttt
22561 atcataattg gacaagcttg ttggattatc tagcacctcc gaaggccac atcttccatc
22621 tcccatgaaa gttaagaagaa aaaaactatc tagcacctcc tccctgattt ctctatcat
22681 tgcgaataaa tatgcctccc tagtccccca taaatttgaa taaaatcata tgtagtgtt
22741 agattggatt taccagtttt tgaattttat taaatttgaa taaaatcata tgtagtgtt
22801 atgtctagct tccctggctc aatagcaaaa cagtgggaa tctctatgct gttcttagtg

22861 gctatatttc atccattttc tttgctgtgt actattttcat tattatttatt gtttagactct
22921 tgaagtcattt ccaactttctg ggtcttagaa tcaaaagctgg tattgaacact tcttccattct
22981 atgaatgcaa tttttgtggga cotattacat gagagtgaaa tagttggctgt atcaagggtac
23041 tagaagaatg ccaaaacattt ttccaaagtgt gtgccaatg acaggttccag tagctcagtta
23101 taagaagtatt ttatgcccc atacctgaca acacatggta ctatagtctt ttttattat
23161 tgcatttttg ataaatgagt aattgtgtct cattttagct ttaataaaca ctctccatgat
23221 tactgataat gttgatcttc tttaaatttt ctatttggca cttggatgtg tgttgtgtgt
23281 tgtgtataat ttttctttga gtgcttgctt gtgaaaattt tttttgagac tagctcttgc
23341 tctgttgccc cggctggagt gtggtagtgc aatcatagt cactgtaacc ttgaacccct
23401 gggctcgagt gacccttctg cctcagcctc ctgagtgagct ggggtttacc cgttcagga
23461 ggtatcattt tttttttct gtgaaaagcc aaataataaa tatlttaggc attgtagcc
23521 ggtatggtct tgtttcacc cctcaactct gtlttggag cacaataaca gttglagaca
23581 atgtagaatg gaaggagtgt ggtgtgtgt caataacatt ttatttacaa aaacagggtg
23641 ttagccacat ttggccgttt gtgtgtttg ctgacctctt gtcattttct cattgtattg
23701 tagtagttct ttatagatct ggtatcagt aattgtaca atgtgtcctt ctaagcaatg
23761 gctaaccttt ctactgtgt aatgaggtct cagacttctt agtttttaatg cagtctgatg
23821 tattgatttt cctttgtgat tagtacttct tgtgacttgt ttaagaatct ttttctacc
23881 cctaaagtaa aagacctttt tctctatatt ttcttctga agtttctattg ttttcttct
23941 tccactgatt ttttaagtgt tagtgttgtt agggccaat gtaatttttt tctctgtgga
24001 ctctatagtt acctgttctt ttccagttgc ttgtcatgca acgtataatca tatttgtctt
24061 tgtgtgtaga tctgtttcag aacctctgt agcattctct tatcttattt cttctttctt
24121 ctcttcttct tcttcttctt ctttcttctt tcttcttctt tcttcttctt tcttcttctt
24181 ctcttcttct ctctcttctt ctctcttctt ctttcttctt tcttcttctt tcttcttctt
24241 tcttcttctt tcttcttctt ctttcttctt tcttcttctt tcttcttctt tcttcttctt
24301 tctcagctct tctcctagcc tagaggcgag tgggtcgctt ttgactattt gcaacctctg
24361 cctctcggtt tcaagccatt ctctcgctc agcctccaga gtagtggga ttacagggtc
24421 acaccactat gactggctaa ttttggat ttttactaga gacaggattt ccacgtgtg
24481 gccagctgt ctcaaacact tgacctcaga tgacctctt gttctcagt cccaagtgc
24541 tgggtactca ggtgtgagcc agcgcatcgg gcccttatgc ttgttaatta ttatggcatt
24601 agataagctt taagttttgt ataagctctt tgccttctt gttcttgaaa ttgtgctgt
24661 gctattctaa ctctgtttc tgcagcactt ggagatggac tcaaggctat gactagcaat
24721 cctaaagtgc catcggtatt gatcctctgt atctttttaa aattctgatg tctagccctt
24781 ctctctgcta actgaagcag gtcaccatgt ggtggcgctt agatgccttt attttaaaaa
24841 caacccctgc tttgcaaat gtaggcaaaa gctgagggtc agcagtgtaa cgggagggtg
24901 taccatgata ctataccacc tgcctagatt tgggtatcca ggtatggctg tttttgccac
24961 taccatgtgc tcaagacctg aatcactctt tgggcctcag tgttgtcat ctcttctgtg
25021 gagggttga atcaattctg caatatctgt tttatcagag gaagcagaca agtaaacata
25081 ggtatgata tgtcttcaa gaagttaaaa gtttgaact gtccttgaag agtgaacaca
25141 gaattttatt acagcatgag gtgaacataa agaaagcaaa actagagcag acctgggaa
25201 tgtccatggc tatgcttctt ggaaaagggt actttgaact gtccttgaag aggtgcaata
25261 gttagctcgg tgggtacggc aagggaaggtc agtaattaga ggggaagcag aggtgcaatg
25321 cgttgggtg gtaaaagaaa tgggtgttgg gggccttggg tagagttaga ggtgcaatga
25381 gaaagatgtg gctagaaaat aaacaccatt tatgccacc taaagatttt caacagtgaa
25441 tctaccatc aggaagaatg catgagcaaa ttcacatttg acacaaatcc tctctgtggg
25501 ctatagtcaa tacattggaa ggccttgaga atggtggcat gctgatcatt tggactatcc
25561 tagaaaatc gttagaagat cgggttcat ttcagaaagt ataaagtata atagactaaa
25621 tagggaaaag gaggaactca tgtctgaggg cccctaat tttcattgt aaggagatgt
25681 tatggggaaa atttgaaga gtaagttaa gtaagttag ctctctatgt gaattttag
25741 tggtaacca accctgttt atgtgattat ctctctatgt gctctgctct cgtgtgaag
25801 ctttgcagga gaggatgaa gggatccatc agaaaggctg ttgcaagtg ttgcaagtg
25861 aaggacgag ggctgcagag ttgaggtact ggaagggag tgatt5aagt gatggacag
25921 tgaatccag atggacagga aaggaaatga tacttgaag accttggaaa ttgacaaaa
25981 tagagagagt cagggtgggt aattccagt aagaYagaaa agtgagtga atgataaaa
26041 agttcagggt gaaaagtga atgccatgt tgagctttt tatctcttag aggccataaa
26101 actaaaaaga cacaggaaca aaatgacct accaccttac attttgcga gtacactact
26161 gctcaggctc tggatggaat tccatgtct cactgtgctt tctgtgaag tctgtgaag
26221 tagaggagat ctctctgctc tttctgctg aaagcagag ccttgagaca cggaaatgt
26281 tccagacga ttgaagtgc cagtctccag tttctggga gctgagtat ccaactttt
26341 tgttgggtg gctcttctg atgtggcat acttgacaca ctggaggtgc ataaagcga
26401 acctcgtgct tctgaattgc aggtggtgta tttcagagtc gatctccac tttccagat
26461 tgggtagag tagcRgctc cagggcaag taactctga gtgtgtgtc ggcctcgtt
26521 cacttctg agtacttca cagatttgc agactttag gtatcttgc ttgtaactgt
26581 tcttgcataa aatatagaat gattttgtt tctaatccc agacagatg atatggctt
26641 atggtctctg tcaaaagatt aatgatcta atctatccac gaagactta gtcagactg

26701 agtcacataat aggtacgttaa taaataaata tttagagatta ttatgtttaca ataaagggaat
26761 gaatgagctg gaatagggaa tcaagtcagaa agtaataWat ttaattttgag gaattttgag
26821 acagaggtctc tggataatgg caaatccctta cgaaaaatctc gggcttacgtc tggggagaatt
26881 gaaaactgaa agtcccacgg aagtctttga aattgaagag ctacagagctc caagaggtttg
26941 ggtattaaaga catctgtctta caccctggaaa agtggtaatg tcccacaattt tgtttttgtt
27001 tcaataccaaa attactctct agcacagtggt ttttgggtcc cYatcaactgt gctcaactctg
27061 aacttgcgtga agttacttcc cgctcttccag ttgtctaaatt gaaacttcaat tccaacctga
27121 ttgtggcatt caacattgct gggcactccc atcagctagg aactctcttc ctactctctt
27181 ctaagactta ttctttgtct ctgtttatct tttttttttt tttttttttt tgggtgtctcc
27241 ttgttaacta tcaactgaatt cttttctctct atatttgggt tttaggtttt tttaggtttt
27301 atgttttccag ctgcggttcat ctctgtgtct cgcttttctg tacattcaag tggattgatt
27361 atagaacctat ccatttggct ctatatctct catatggctc catatggctc tccacttggg
27421 cctttctccc aatctccaga ttcttttctc caacctctta atgtacagtc tcttttagacc
27481 cctccatccc caccactcac cccatgcacc atgtttagat ctatttttta tctttaccct
27541 aaataggctc attttcttca ttcttttgca ttcttctctc ttcttagtaa cactcttctg
27601 taccctaagc tgtagaagtc ctgctccctc tgcatttctc aaatttgtYa tcaaatctctg
27661 tggactggaa ctgcttaaaa taattgtttt ttgttttttt ctgtctatcc ctactctccct
27721 gctttagttt aggttccatt tggctcagtt ttatggaaat ttatggaaat tggcttttctg
27781 cattgcaacta ttttaactct ttaaactaca cagcaactaa aggatWtcc tcaaaagaaa
27841 atctgattgt tttattctct tgcctcagaaa gcYctgtatg tctgtctctc tctctagttt
27901 ttctgttcca gttctctctga ctgcctcacc agttttatct ccatcactat tctgtaccca
27961 ctgcatctta tgaagaattc tcaaggctat ttgtgttttc tgaaaatttg tcatgtctgg
28021 gtcaggagtt ttcttccagt tgcctggaaat acataaggca tccaagggtg gacgtctattg
28081 tctttaactat ttttaatttta aotcttgtaa gtgagacatt tccaaggtct aactttaaga
28141 aaatccaagc tcattgagag ttttaacttt gaaataatgt tccaagtggt cagaataaga
28201 gYagttctaa ttatagcaaa gcacagaaat gKccctcagM tccaaggtctg aactttaaga
28261 tgattaaaaat atgtatatct tgaagaagaa aatgaaccca tcaagaagag gactgtccag
28321 ccatggaaagc acagcaaggg aggccagag actgtgctta gccagagact actcaggggtc
28381 gcctgtccag ggaagaggtt tatgaaatgt gaggactaga cattgtactt tgtttgggtc
28441 gagtctagtg gcttatgctt gtaactctag cactttggga ggctaaggtg ggcagactcc
28501 ttgagctcag gtgttcgaga ccagcctggg ctctcatggt aaaccccacc tgtactaaa
28561 aaacaaaaaaa ttgggtgtgt gtggcacgta cctgtagtcc cagctactgc gagggtctga
28621 tggggagagt cccccgagct caggaaagtg gcgacagagc taagacctgt tcccacaaa
28681 aaaaaaaaaa aaaaaaaag tgcctgtctg tatctaaaag aaggagacat cacaatatac
28741 gagtctgctc cctttataca tctaactctg attagtaatt cccattttgt ttgacaagca
28801 gttgtcagat tatgagttgg ttcccatat caggttatta tagggaata atgtaacct
28861 tataggaaat agcatttcac attataaata aaccaatgct tgtttggcat taattattta
28921 ctgcatcctg ctggcggtct ctattcatgc ttttccaggg gtggaagatg aaggtgact
28981 ctgaacctg cttaagtgg gagagagctc aacacttggg caggtaaata tttatttaat
29041 taggagtttg catgttgatt ttattcttta gattgtgca tctctgagga gagggtattg
29101 atcttagtctc tgcattggcca ggctgtgca agtgtaggca aactgcagga attcfaatg
29161 ttgaatgaac aaatggactc aattagctaa cgactcactc tgtgagactg agctctttg
29221 aggcagagga gcaggttttg gagaattcag aaggtggccc aagggaatga agaatgttg
29281 attagcatga gaatgtgagc ctaggacagg acagagaaac agtgaggtct gcctctggg
29341 tggttgtctg gagagaaagc attcctgaga ctcaactggtc ttctgggttg tgggtgtg
29401 ggtttgtgctc ttgtccatgg aggagagcatg ggaagcggga gaagtgtatg gacatctgc
29461 caccataaac ctggccaagt tcccttgatc actgttcaga ccttcaaat aggtgttgt
29521 gaagaattat tttagacttc tataaMgtcc aatgcttgat aagtgcagaa aggttaattg
29581 ggcccgcag gcagtgggag cagtgttat tcaactgggt tccagctctt ggcagaggtg
29641 ctggggccat taagcggag tccactgggca gacatggggt cctgaaaggt gaggacatc
29701 ctgctgtctc atgtcctcct gcaaaaaact gaccacggct cagttttYct ccatgaaagt
29761 ttcttctcaa ctacagtag ccaactcctc ctcaagctct atagactta ttgtttgat
29821 cattcacttc agcctgtaaa atatcctttg tcaaatctgt gtatatctat atacacacac
29881 atgcacatc atatgtacac acacacacat atatacacat tatatacact tatagcacag
29941 aatctgtctg cctatctatc catctatcat caatctatca tctacttaat tttctattta
30001 cttagctagc tagctatctg ttgtcttcca gtttagacta aaattactta aatWctaggt
30061 atcacagagc ttcttaagta ttcaattgat tgaaatttgt tttatttgg atttagaactg
30121 taacagagatt aaagggagc ggttcaactgt ttgtgaaacc aggccttttg tagcaatgt
30181 ctggcgagag gacagagggg actacgctgt tcaagccata ctgacacact cagggaagc
30241 ctacagagtt ttaaatggca tcaactgtgag cattagtaag ttgtctcat tagctgtc
30301 gccttgtatt tctgtgctt tctgtgaaat ggcttctggc ttgtgggttt gggctttgag
30361 caggagtgat tctaggtctt ggtttccctg aaggtcagta ggcctctaga cctgcacat
30421 ttagaatcag aaggtgggaa gagttaggca gaaggcctag agcagcttag atcttaattg
30481 tgaacaacag aacctcaaa actcttgggt gatttgtgaa aatttaattg gatcatgac

30541 atagactagc tgcctgggta cctgatgaaa cacaagtatc tagacaatag tagatgtgat
 30601 aagaatgact gcctctcaac taagccttca ttgtcgtgaa tattcMtgcc ggcctctccag
 30661 ctgagcgctc cccctgcctca agtgccgcag agctcagagt tctggatgat gtccctgggat
 30721 atctcgtcgt tcaatggact gtgtctctcag cccagagcag ccagctctctc tagacaatag
 30781 cctggagagt tgaaagttag atcttagggg aagaagaacac cctaaagata aattagctca
 30841 agccactaat taattttaat ttttttaatt ttcaattttt gtgggtacat aataggatata
 30901 tatatttata tatagtatgt gcatatatta cataataata ggtgtattat atatatataat
 30961 atgggtataa gatataataa acacataata agtgtatata ttacataata tgtgatatat
 31021 taataatcac gagcataqaa ttttttttca ttttttggtg tctctctcaa tttctttcat
 31081 cagtgttcta tagtttttcat tatagagatc tttaactctt ttggtttaatt cctaggttat
 31141 taattttcgKt taattccctat gtatttttaatt atttttgaaa tgaatgatat gtttttatgtg
 31201 tggctattgt aaatgggatt actgttaaaa tatcttttca catgtgtcac tgcgtgcata
 31261 tagaaatgct actgattttt gtatgtcgtat ttigtatcca gcaactctac tgaattttat
 31321 agtttctaata gttttcttgt ggagtcctta ggttttccca aatatagaat catcatctat
 31381 gccaaacatg ataattttgaa ttctcttttt ctaattttga tgcgcttgtt atctttctct
 31441 tgtctgtatt cctcagctag gacttccagt acaatgttga ataacagtgt tgacaggtggg
 31501 catcctcttc gtgttccaga acttagagga aaggccttctg ttttttcccc attccagtatt
 31561 atactgtctg tgggtctgtc acatatggct ttattacat tgagacatgt tctctctact
 31621 tccagttttt tgagggtttt tatcatgacc tgcgtgaatt tatcaaatgt tttttccgca
 31681 tcaattgcga tgaccatagt gtttttagcc ttattctgtg tgaatgata gttttaccat
 31741 attgatttgc aaatgttaaa ccatctctgc atccttagga tgaatcccat ttggtcatga
 31801 tgaatgattt ttctaagtga ttgttgaatt ctgttttgcta gtaactttgtt gaggtttgat
 31861 gcatcaatat tcatcagaga tacttgccta tagtttttct tctctttttt ttttttgatg
 31921 tgtcttttgtc tgggttttgt atcagggttaa taactggcct cataaaatga atttggtagt
 31981 atcttctcat cctctatttt ttggaatagt ttgagcagga ttggtattag ttctctttta
 32041 aatgttttgt agaatctagt ggtgaagcca tccagctcta gacttttctt taataaagag
 32101 acttctttctt ctttaataaa gatactttat taaaatttct atattgttacc ttgttatgtg
 32161 tctgttttag ttttggattt cttctgggtt caactcttgt aggtgtgtatt tgcctaggaa
 32221 ttgtcccatc tcttctagag ggatttcccta ttcatgtgca tcaagtgtct catagtacc
 32281 attaataatc ttttggattt ctgcaaatatc agttgtaatg tctcttattt catttctggt
 32341 ttattttatt tgtatctcct ctcttttttg cttaagtctg ctaagagttt gtcaattttt
 32401 ttctcttttt taaaagaacca acttttttgt tcaattgact tctgtgtttt tttatttca
 32461 atttcattta ttcttcttcc taattttggg cctgggttgc tcttgccttt ctagtcttct
 32521 aagatacatc attagattgt ttgtttgaag ttttctctct tttttagtg catgacctat
 32581 agctataaac ttcttcttga gtactgcttt tgcgtatcc catatgtttt agtatgttgt
 32641 gtttccatta ttgttttcaa gaaatttttc agtttctctt ttaatttctt catgaccoca
 32701 ctggttcaatc agaagcatac tgttttaatt ccagtattt gtatagtttc caaaatctct
 32761 ctggttattg atttctagtt ttattccatt tgggtcagag aagatgctgt atattattcc
 32821 aattttttca gtgtcttaag acttgttttg tgacctaaac gatgtctgt ccttgagaat
 32881 gatccatgtg ctaaggaaaa gaatatgtat tctacagcca ttggatgaaa gtttctgtaa
 32941 atggatctat tagatccatt tgggtctatag tgcagataaa gtcagatgtt tcttctgtga
 33001 ttcttctgctt ggaagatctg tccaatgctg aagtgggagt attgaagtct ccagctatta
 33061 tgtatttga gcctatctt ctcttttagct ccaataatat ttgttttata atctgagtgct
 33121 ttcagatgtg ggtgttatat cctcttgctg aattgacctt ttatctatta aatagtgact
 33181 tgccttgtct ttttttatag tttttgtcct gaatatctat ttctctaaag atagctactc
 33241 ctgctctttt ttttgttttt gattgtcag gaatatctt ttctacact ttattttcag
 33301 tctatgtgtg tctttatagg tgaagtgtg aacaatacaa tgggtcttgt ttttctatc
 33361 attcagccat tctacatctc tttaattggag agttttagtc attttacatt ttatttatta
 33421 ttagatgcta gaacttact ctgtcatttt gtattttgt ttctgtctgt ttgttctctc
 33481 tctctctctc ttcttctctt cctgtctctt tttagtgaag gtgattttgt ctggtgata
 33541 gaactgtatt ctgtcttttt atttttttgt gactctattg cattttttct ggttggagt
 33601 tctcatgagg ctgaaaaata ctattttata acccatatt ttaaccggat acaacttaa
 33661 tattgtttgc ataaacaaac aagcaaaaag aaaactaata aaaatttacc accttaactt
 33721 ttttccctgt ctttttaact ttttgttgtc tctatttata tcttgtact acctacact
 33781 gaaaagtgt ttagttattt atttttgatt ggttcatcat tcaagtcttc taggtataaga
 33841 acagtgttca accacagtta cagtgtaaaa atattctgtg ttattctgtg tacttattat
 33901 aaccagtgag ttgtgtgct ttgggtgatt actcattgct cattaatgtc ctttcttctc
 33961 ttagtgaagt actcccttta acattttctg taggacaggt cagtgataag aatccctcag
 34021 tcttctgttt tctgggaag tctatttctt ctctatgtt gaaggttatt ttgtggata
 34081 tgtatttcta ggtgtaacgt ttttaaaatg tgtcatgcca cctcctgacct ataaagtttc
 34141 cactgaaaag tctgctgcta gatgtattag agctccattt tagrttattt gtctcttttc
 34201 tcttctgctc tttagaatcc ttcttttata cttgaccttt gggagataga ttcttaattg
 34261 tcttgacgta gtctcttttg gattaaatct gctgggtgtt ctataacctt cttgtattat
 34321 gggactgata tcttcttcta ggtttgggaa gttctctgtt atccttttga ataaactttc

34381 taectcttttc tgtttctcta cctcctctgt aaagccaata acttttagat ttgccttttt
 34441 gaggtatctc tctagattct gtatgcaatg ctctcatgtt ttttatcttt ttctctcttt
 34501 tctccttttca ctgtgtattt tcagatagcc tgctctccag cctgctaatt cttctctctg
 34561 cttgatatac tctctatta aaggactctg atgcattctt caaatagcca attgcatatt
 34621 ttcatltcca gaatttctgc ttgatttaaa aaattctatt tcaattctct ttgttaaatt
 34681 atctgatalga atttctgaatt cctttctat gtatctctga atttctctga atttctctca
 34741 cacagctatt ttgaattctc tgactgaaac atcacatatc tctgttctct caggattggc
 34801 cctctgtgcc ttatttaatt catttgagg ggtcatgttt ttctgtgagg gttgatgtt
 34861 agtagattgt ttctcagtgc tgggcattta aaagttagt attatttgta gtctcactc
 34921 tctggactta ttttactgt tctctcttg gaagccttc caaaggattt gtagtittcg
 34981 atcaaaagctg tatctgcttt agggggcacc ctaagccagc taatgctctg gtctcttgag
 35041 acctgtagag gtaccacott gatgatcttg gacaatatc ggagagaatt tctgatatc
 35101 aggcagagac ttgttctctt ccttactttt ctcccaaaac aacagagctt gtctgtctgt
 35161 tctgagccac ctaaaagctga tgggtgagtg acacagggac cactttggcc atgacacta
 35221 ggactgctgt ctgacagctg aagccagcac agcgcctggg ctgcccagc gccctgttta
 35281 cccactccct ggcactgct tatgtttgct ttaggccctg gtgctatca atcagccgt
 35341 ggcaaaagcct gccaggcctg tgtccctccc atcatggctg attgccaact gcaaggcttc
 35401 tcaagcccca ggtggatcca gaggtgccat ctaggagtga ggttagtag taaaacaacc
 35461 ttagaagctt accaaagtgtt tttttgact gcagctgagc tggcagtcac acccaagac
 35521 gtgtctcttc ccaactcttc ctccccttcc caaaggcaga ggagctccag catcttagc
 35581 cagtggccaca gccggccaca aggaagtact ccagactacc gcagattctt ccttaagctt
 35641 caagagctct taagtacgt tgtggcaaat gctgccttc tggactcac atcagggvc
 35701 actgggctcc ctctggccc agggcactgt cagaagtccc atccaagatt caagtccag
 35761 aatcagggca ctaaaagacc tgcctcatga cctaccctcc ctctggcta taaagtacc
 35821 tgaagtgcac gacaaaactt tctctgctt tttctcaagc aaaaaggatt ttgcctatac
 35881 actactgtgc ctaataatgt gctcagcttc acctaaagcc agcaacttcc atgactcac
 35941 ccaagcattt caatgataa cctggataat tgctactgat tatctatggc caaaggactc
 36001 ttaagttagc aggtgatgaa tgcgcgaagg actgaactct tccgtcaag ccagcggctg
 36061 cctctctggc ccatggtatg tctgtaaatg ttactggga ggccgtggaac aggggcttca
 36121 tgactctgat catgtttctc tcttgcctgt gctgagctgg ctccaagatg atgactcac
 36181 tctctctcgc tcttccctct cctctccta agcagaagga aagcgtctct tttatagctg
 36241 caaagtgctc agtctggggg gataaagagg ggtgatgcc acctccctt gttgcctta
 36301 gtgggaataa ctgaggtata ttgcatgtcc cactccagtc cccgtctctt gggcagctg
 36361 aggactcacc taagagttgc agtccctgtg gccagactg cctctcaagt ttacttagat
 36421 acccagagca ctttagcttg tgggtgtag atttaacagga actcaagtgc tgactcgtg
 36481 gattaacaat tccctctgtc tagggctggg ttaaatgttc cctccatgag cccgtggcag
 36541 ctgagtttgg tccagtttct ctttctgttc taacaagtc gcattgagtt cagtgcctca
 36601 caattgtggg gtcttctctc ctccagcaac cagagacact ctcagtacca tgcgcgact
 36661 gtccgggggt ggcgagagtg gcatgtgga ttgagactg ctttttctat ctcatgtgtg
 36721 tctctttctg tgatacagat ttaaaaccag atactatgag tgatttttgg tcttatgaa
 36781 ggtgttttct ctgtgtagat ggtgtttaac ttggtgtctt tggtagggag acaattggcg
 36841 gattcttctc ttctgccatc ttgttccaca ttctctccc aagctataca ttattcacag
 36901 ttccaggagag gKagcaact attcaaggtc acaaaScgtg ttattgtcag aaacagagcc
 36961 agagctctgg catccaatgc ccaggccagc attgggtttt tttagtttct atatttactc
 37021 gtctctgctg tgggtggctt tgccttctt tttagtagaaa gttgttttct atatttactc
 37081 atctagatga gaagaactaa aggcgtgata ctctttgat tttagacttc ttatttgaac
 37141 ctagtttcca tcaacttca gactactagg ggagactgag ctaYttctgg gtgtgtgga
 37201 tccctatggg gatctggta gcatgggtgg ctccctctg ctccctctg agaggccct
 37261 ttaactctgt cagtccagtg actccctgaa ttccagctg ctctctagag aggccgttt
 37321 agtccctcta tgttctttgc agcaactgct catttgatt aatatatttg ggtgtgtct
 37381 caattttaat tgttcatgct aaaagcacag tcattaagaa aatTaattgt acaagtttt
 37441 ttgattttct ctgctcttgg gttttctgct tctctgaaa aagacacgtc ctgttatac
 37501 cctcatctgt ttacagattg aatccctggc ctgagccca gtgcctggcc tagactggaa
 37561 accagctcat tattaagtg aatgatlgac tactataag taaatagtt cttatgttgc
 37621 ctgaggggaa attttgtaag gtgaaattgc tcaggtaaaa tgaagaatcc ctaagaagt
 37681 aactgggttc agtagtcact acttcatggt caataaacaat tatttatga agacttatg
 37741 gccagttata tggaaagttc tgataattca aaagtgaaaa gcattgttct tctactatg
 37801 aaactctcag acatggtgat ggtgaatcta ggggttaaat ggaatcattt accattatg
 37861 ctaagggtga gagccacaga cagtgtttgc ggagcaggaa aagaaataaga agggccgtg
 37921 ggtggcagc aaatggtctg ggaagccttc caagaggaaa ggaattctta cctgaattt
 37981 gaagaatgaa taggattcac aaaaagtaag gaggggtgag aggggtctct aggcagagag
 38041 aacagaggga acagtatagg acaaaagcat gaagtgttaa gcattatgt tatgttgaat
 38101 ctaaaatgac ttctataga tcttatgtga gtatgggggt gggaggggtg gactgaggt
 38161 catggagtta agcagggcaa ggtccagggg actgtttatg catagggtt accatcagc

38221 cactgaaggg ccctgggacg gtgcaaatgc agagtcattg ggctgcattt gtgatgggag
38281 acatcagatt tgagatgatt tgaagccaga gttgagcagg gctggcgccg tctggagacca
38341 cttagagagct tgataaaaaa tccaaaagag tgcctgatagt ctcaacttgg gaagaggcca
38401 tggggggagct cctcttcaag caatcattta agaactcttt gctgagactg gacaaaggat
38461 aggtttctgtg ccaggccagag agaacatggt ggtgaagaaa acagaccacc ccaactgctct
38521 gatgaagctt gaagcgtgaa aggaaggcag agaatataca gataatccac taataagagt
38581 tgtaattata gggaaagtga aagcgtgaag gaaagaaaaa atctagcttc aaacagacca
38641 gggcctctgt aaaaagcagt ggcctcaggga aagctttctg ataattgata tgcgtagtgt
38701 cagggaagcat tatgtggatg atggagtgtg ggagattttt tccagactag aggaagtatg
38761 aaatgtgeag accctggcac aagagggaac ttggagtatc tgaagagtac aagaacggcg
38821 tagagtgtat ctgaatgaga gaaattatgg caggtgtatg ggttgggtaa gtatgctggg
38881 gccaaagatca agtaggaacc agcaattcag agtaagtatg atgaatttta tcttaagaac
38941 aatgacaagc agccagacag atcaaaagca ggaagtagt atgagtgtat tttcatttct
39001 gaaacagcag actggccgct gtgcacagaa tgatccattc caggtgtgat cgaagtgtca
39061 ggtRcagaag cgcaggttaag gcatgaaggc acaggttaac tgatgtcatt gaagtggag
39121 agtatgtgat gggttcaaagg cacttaaga ggttaaaacc acagatttag ttgtggaatg
39181 aatatgggga gaaattatgg aaggtcaaaa aagttaacca ggctttttga catgactat
39241 tgactgtgat ggttctcatt tgcagtgaag aaaaatggct tggagaaaaa ccaagatttag
39301 gagtgtgagct atgagttttg tcatgtctac gttgagtata agtKtcccttt ggtatgttga
39361 ggtccagagat aggtcatggc ctgtatgggc atggagctta gaggaaagac tggagactg
39421 acccttcaag tcattggcct tgaaatgata ttggaagtag tgggtgtgaa tgaagtgtct
39481 taggaaaaat atggaaaaa gaaggcctag aagtgaagaa aagacacagc tgaagaaatg
39541 gaggggcaaa gtagtgtaat ttggtgattg acaagttgaa gaaggtgaaa aaaaagctgt
39601 tgcctagaaat ggtttctgga ttttacctgt gtgtgatcta agttagatg atcaattaac
39661 aagctgggga taacttttgt ttgggacatg ctgcatttaa atgattttgt taatgcacat
39721 ttattattgc catcataaaa gatattgatt ttgcatittt tcttgactcc tctcttaaaa
39781 cttttccata tccactcca aatatatagg aggaatactg gaactaagta ggtgatgct
39841 aaattttggc agacaaatgg gagaggaaa aagttagaaa agttagtgg caggaggtc
39901 cagggtgata atacagggg ataatgctaa agtttgggtg taggattgaa gagttagaat
39961 aatagtagaa gaggcgggga tataaaaata tatggaaatg cagagtgtga ggaggaagag
40021 gaaaactgaa gatattgatg accctcacag atccctcatc caactttgac taattcaaac
40081 tcttggaagt acttttttca tctttacctc taccatttcc caccagttgc caagatttat
40141 ttaaagtatg tcaaaaacat gatattgatt ttccactcta cataaccatt ttataaggac
40201 aaaaactatg aatatggaaa cagattaatg gttgccatgg aacaggaact cgtgaggga
40261 gttttttgaa ggttaaaaca gagggttact atttctctca agctagcacc taagccaggc
40321 ctttgtctat agccactgcc tgcaaaagtg ttttggatta ttaagtattg agatttttat
40381 ataaaagctt attagtttat attataaaga atatatgta tggttttatc aaaaatattg
40441 ccaaaatgaa ctctcttgat agctcagctt ctgacttatt tttttttct tttttggcaa
40501 ttcagttact tctggttgaa aatgtgtatt tatggagtga gattttgacc agagcttatt
40561 gatgtgtctg tctgttgggc tctatgctat tacatcaagf tacttgggaa tgtatcatic
40621 gtgattctaa tgcaatttcc tgtgggtatg atttcttagc agaaagagctt ggtatgtgag
40681 gaagtgtccc taaaatcatt tatccaaaaa atcatcaat tgaagtacg ctgtggtgag
40741 aaaaattatg aagccattga aatcaccagg ggaagagctc attatgttgg catattcttg
40801 tgaatttttt gaattttaag gatgaagata aatcctatac acaccaggtt tccagtttat
40861 gatatactg agctcatggg gagaggaaac aaaaataaac accagagagc ggaagrtgg
40921 aaaaagttgt gtagcagaga agtctggcaa tggagactat ggccccaaga tcttatatt
40981 aaatctgttt atgcaaaagg aatgaaaatg caaataattc ttcagacaa atcataata
41041 atataaaact actataaat aatgttgacc aggagtctg gattatatta cctcaaatg
41101 caagatata tMaggagttg aaaaaaatta tgatgttata ttccttaact taatgtgaa
41161 aggatcaata agtatgtcct caatttgtga tctaatatga taaaaggcca ctaattact
41221 tttaaaata aaaaaatac actagtggcc aggcagcgtg gctcacgctt gtaattccta
41281 cactttagga ggctgaggca ggcagatcat gaggtcagga gatcaagacc atctccggc
41341 acccgttgaa aactgtctt tactaaaaaa tacaaaaaat tagccgggca tttgtggcag
41401 cgcctgtagt cccagctact tgggagggcg aggcagtaga atggcgtgaa cccggagtg
41461 agagcttgca gtgagccgag atcgccacac tgcaactcca cggcgacaga gcgagactcc
41521 gttccaaaac aaaaacaaac aaaaacaaac aaaaaaaatc actagtataa taattattgt
41581 gtattacatc tgaaaaaaa gcaaatatga caaaatctc aagatctcac aaaaatgaaa
41641 gtttttgtgt tctagtgtat tcaaaactaa taagtctaaa agtctcagaa atacaataca
41701 acaaaacacg acaattgttt cagtgttagg gggagatttt aacatactct tgctttgaga
41761 aatttactag gaagtgaaga gtctacatgt ttcgaggaat atagtataag atgtgtgtct
41821 aaatcatagc tcaactctag aaactctat gaaaaaccag agtccaaaag aggaattgt
41881 acgactcatg gggtaataa acgatacagt aatttatatc atttatatc aaaaacaaa
41941 aataaaaaaa tgcacttaa taagtattgt aagtcagcga tttgttaatt agcttgatt
42001 aattatttcta caatataaac atatatcaaa acatcacatc gtaccataa atatatgta

42061 ttattttttg tctattaaaa ctaaaagaaaa atttaaaaaa ttaaaacaaca acaaaaaatc
42121 tcttaatttat ttgcattttt gatttagagag ccaaagccat agttaaaaga tatttagaaa
42181 ataataatag tgagaatagc tcatatcaaa tticattggca tatgaccaaa tcttaaaaaa
42241 ttttatattct taaataacat tattattagt aagtgtggaa ataattaaaa tatcaacta
42301 accattttgac tctataaaaag gaccaactaa acacaagaaa tagaagtaga aaataatgaa
42361 tttatttagag gaaaataaaac taatagaatc tgtccagag ttgtttaaga caagaagagt
42421 tgaggtgggg gttggggaga aagttaaac tccagcaaat ctaatcccca aggtggagag
42481 accaccaaat ataaaaaaat tagaaaatg gaaaagccta tataaaaaaa caaatggaaa
42541 gagataaat ctgttttaaat gcctctaggc ccatatgtt tttaggataat tcttttaac
42601 tttcaaggaaa ataataatc ctataataaa ggataattgt ctacacatta tctatttag
42661 gaatagtcct aaaaagacaaa ttggctgtt ttatctctct taattgacct tcttttcta
42721 ctctgtcttt tggaaattct agccaatgta tttagacaat taaaagcgaa gagaaggagt
42781 ttgggaagt ttggaggagg gaagataaac ataacttta aaacatgac tactgtttc
42841 tacttagaaa ttttgagaaa attaagtaaa aaactataat cactagacct tcttttaa
42901 tgtttattta atacaaaata aacattcaaa gctaatagca tttttacatg cctgaaatg
42961 catatattat gtaatcaggg aaaaacagca tcacaattgc aatacaga aaacacagt
43021 aaggaaacca tgaacaagaa attaggaggga ctgtccata tgtataaaaa tgcagacct
43081 tatcatttta ttgttggaac ataaaaagaat atgtgtttta tgaaaatttc aaagacct
43141 cctaataatga aacactcagt ataaaaatg ttatttctct tagataatta tacaagttt
43201 atataataacc aattaataa ccaaatatcc taaaacttgt caaacactgt ctaaaattta
43261 tgtcaaaaat gctggaaaaca gttagccaag aaaaaattga attagagaaa aaagagccat
43321 tctcttgtga gattataaat atattataaa gatagagatt attagtattg caacaaatt
43381 gctgactagg ggcctcctagc actaatcccc gtacaaaagg gccaaaatat aaaaataatg
43441 gctacatttt gactagcgtg tctgaaggag ggcgctggag tgcagcatgg taatagga
43501 atccctgttg agcacagaaa cccagatagg cagcatagag aggggagaaa atcacccttt
43561 ctctgtcact cgttttcccc caacaagatt gacttggagc caccagaaac cttctttg
43621 agggaaaaag taagcagaag gcctctgcca ccttctat taaccacagac aggtgacct
43681 ctgtctacag aagaaagcgt cagtcctcac aggtcctgag cccagtttgg ccctgagct
43741 ggaagtctca tggctatatt gctccagtgc aggaacctac attgtgcta ccttatccc
43801 ctatgacca tgcgtctaca tcatgccact gctctggaat tatagctact gctagatgt
43861 gtctctgttt gggggccagt agccactgca tctctccat cccaattgtg tccgtctat
43921 tccactgttt catacaggtg gctacaact caaaatcctg gttacttga ttctggccc
43981 tatgaattca ctgtgatcct ggtttccaaa tgcacatggt gccctgtctc ctgtttgac
44041 aggcagtcct gcacaactgg ggaagctttc cctagccagc agacactact gctcaccct
44101 catacccatg agggtgtaca tactcaccct catctcgaga acagccagc tagccctgca
44161 cctggcaaga gcacacccct tttccattgg acctactgtg tgtgcacaca caccctggc
44221 ctgagaacca acatggtagc ccagcaccct gcaaaagccat gccactgcca gtacaaactc
44281 ctgcagccta ggcactgag acactcaaa atactgcaga tgtggaattg agctgaagaa
44341 actgcatgaa gactacact ctgtctctgt ctagaacca agccaacata ccttatccaa
44401 ctgacatgct aggatgcact tacagaaaaa gtctttctct aataaagcta cttcataaaa
44461 ttagaagagg tgactgttgc accagaagtg cagctatcaa cataaggaca caagaacat
44521 gaaaaaacag gaaacatgaa aaaacaggaa acatgatacc taaaggagc aaataatc
44581 tccagatgaa aacctcaaa aaaaataagt ttgctaaatg cctgaaaagg aaggaatcca
44641 aaataatgat cttaggaaa cccagctaga tacaagaaa tacaagcaaa atttgaatc
44701 aaatcagaaa aacaatttat gatctgaata agaaattcaa cagatagata ttataaaaa
44761 gaaccaagaa gaactctgag cttaataatt caatgaatga attaaatgca atttgaagt
44821 caacaacaga attcaacaa ctagtatca ttataaatg acctctttg tctctctta
44881 taatttttaa ctgaaagtct attttatctg atgtaagtgt agctactcct gctgtcttt
44941 gttttccatt tgactggaat atcttttttt catctctcta cttttctgtt atatgtatcc
45001 ttaactggacc tactgtgagt cagtgaatga gtgagtctct tttaggcagc atatgtatcc
45061 tctctgtttt tttcttttaa tccattttgc cactgtatgt ctltgaat ta gagaatttaa
45121 tccatttaca tccaagatta ttattgatlg gtaagaacat gactcctgac attttgttat
45181 ttgtattatg gttgttttgc agatccttgg ctctctttct tctctctgt tacttttgt
45241 ggtttgtgtg tctctgttag tcttaagctt tgattctctt cctcttttat tgtgtatat
45301 ctgcagtttt tatcattgtg gctaccatga ggctaaaaa aagactttta tggttataat
45361 aggcattttt aacttgatta caatttaact ttggtcaat aaaaaatccc taactttta
45421 ttttccccct aacagtttat actttgttgg ccttaattca catcatata ctactgtgt
45481 ctgttataaa ccaattgtgt ctgtagttat ttttgacct ttgtaccttt aaactttta
45541 ctagagtctt gaaagattta catagcgcca tttaagaatt gagatattct gaatttgtat
45601 tggaaattat cctactggt tagttttcac atgtttttat gaggtaatt atacccttt
45661 caactttcagt tgcagcattt ccttagggat ttctgttag gctgtcttag cagcaatgaa
45721 tctccctagt ttgtcctgt ctggaaggga ctttaatttt cttacattct tgaagaatg
45781 ttgtctgtgt tatagtatcc ttgtagtaca gtttttaatt ttgttcagca ctgaatata
45841 tatcctttgt tcatgaattg gaagaattaa tattgtcaaa tattgctacc

45901	aacttacaga	ttcaatgcaa	tccctactaa	aataccaatg	acattatntt	gacqaaaaga
45961	gaagaaacag	tctctaaaatt	tgataggac	catataaacac	cttgaatagc	aaaagcaatc
46021	ttgagaaaaa	gacccaaaagg	cccaaaaacca	aaaacaaaagc	tgagggtatg	acactacctg
46081	actctcaaat	atactaaaaa	gctatagtaa	tcaaaaacagc	atgatgttag	catgaaaaa
46141	ggcactataga	tcaatggagc	agaaatagaga	gtccagaaat	aagtcacca	atccacagcc
46201	aactgatatt	tgacaaaagt	gccaggaaca	acacttaaac	aagtaaaagc	ctcttcaata
46261	aatgggtata	ggaaaatttg	atataccat	cgagaaagt	gaaactagac	ccctactctt
46321	taactatctc	aaaactcaac	ttgaaatgga	ttaaagactt	aaataaagc	gtgaaactat
46381	gaaactacta	gaagaaaaca	tagaggaaat	gctcatgaca	ttggactggg	caagatgttt
46441	tggaatagat	ctcaaaaagc	cagacaacaa	aagttaaaat	agacaaatgg	aattacatca
46501	aaccaaaagg	cttctgaaca	gtaaaagaaa	caatcaaacg	agtgaaaaca	taattctacg
46561	aatgggaaag	aataatttgta	aactgtgcat	ctgacaaggg	gttaatatcc	agaatataga
46621	aggaactcaa	acagctgaat	aaacaaaaca	caaaacaaaa	acaaaaacaa	gaacacacaa
46681	taactttgatt	aaaaaatgga	cagaagacat	tgctctggg	attcagacaa	tatcctgttt
46741	tcttgatgag	gtgaaagtgt	tacagatatt	tgcttatgat	aattcaattaa	cttgataatt
46801	ctattctata	ctgtttggta	catgtgtgtt	ataattcaca	atcatttttt	aaaaaatatt
46861	catttagaat	aaagaacact	ccttgaatgt	tagaattacc	taagctcatg	ggacaaaagt
46921	caatggagact	ataaattgat	gaaatttggt	aatgtgtgta	gaggcgaagt	aagggaaga
46981	gagggaaaagg	gtgggggtta	cattttggta	agcgaataat	tactggattg	tggtgttaga
47041	aaactagagat	tcatatttca	tttctctctc	taattaattt	gggcaagatca	ctcaactcat
47101	ctgaactcca	gtttttgcat	ccttaacatg	aggataaagt	ccccctccct	tttctgtcct
47161	tgtgaagtgt	gtttgaagt	tcaaaagactg	aaggataaaa	tgcataaaat	actttgtgaa
47221	cttgcgaatt	ctttgctagt	gttactagga	gtagaataatg	catttgtgta	ctgtgatgtg
47281	ttgttgtaag	catgtgtgtc	cctttacaat	ggttgtcctg	gaagccactg	tgccccctgt
47341	ggwtctctct	cagggaagaa	aaaaagtaga	ttaacttttg	cctagggggc	tatttctgtg
47401	aaatcaaaagg	tattcgaggc	tcgagagtac	gatgcacttg	taatccagat	gttaacaaat
47461	ttgaaagtgt	gtagaatttt	cattgaatat	tgatgatatt	gggttttttt	aggtaccact
47521	ctgattgtg	actgcaatgt	aacagacacc	aaggataata	caaatctacg	atgtgggaga
47581	gtcaataaca	ctttgggtgga	tgattactat	gatgaatcca	aacgaatcac	agaaaggggtg
47641	gagtaggtgt	tttgcctttt	tgacttctct	aaacgttagc	caagtattct	ctacttaagt
47701	gaatctgtga	tcaactactgc	cttctctctc	tggttttgcc	tctcaatgat	ctatgttatc
47761	aaatcccaact	atcacatagt	tagggagata	tggtaaaaga	ccaggtatcc	ctgagagagc
47821	taagatccat	ttctcttagc	tactactcaa	aattagtcct	atttccactt	agttataatc
47881	tgagccatcg	gccttcaaa	cttaatgccc	Ygggcataca	aaagcaaac	tggaatagac
47941	acaaatgtgt	atattgcaac	agtagaagaa	agaaatagta	gtatagttct	ttgtataact
48001	aaacaagcRc	caatggggac	tcttagggaa	gacagtgcac	aatcaltagc	taattgaatg
48061	gggtataaact	caagttagtg	tggtataaat	ggagtgtgtg	aaataaaact	aatggaagta
48121	gagggcagga	gagcttgtgt	tgggcctcgc	agtagtgata	agttaggata	cttggaagct
48181	aataggggaa	aggccttttg	ggctgagaa	gggtctgtga	gctaacagaa	cctactctcc
48241	ttgtccacct	cgagaagaaa	atgcataatt	gggaataatc	aatctacaaa	cctcaactgg
48301	ccagtcagca	aagtattttt	aggataacat	gatggcccaa	agtgtttcca	agaataaac
48361	tttatctcca	gaaaacagat	tataaaatat	gttgggttaa	cttgactcat	taataatga
48421	cttactcttt	tcttttatag	aacctatgtc	tcttttcggg	aacataattt	gtacacagta
48481	aacataacct	tcttggaagt	gaaaatggaa	gattatggcc	ttcctttcat	gtgccagct
48541	ggagtgtcca	cagcatatcat	tattattacag	ctccagagta	atactccagt	gggttacaca
48601	ctgttcagag	gtttcaaaac	Satggccagg	aaacacatct	gaaggagcag	tgcaacttaa
48661	tgctcagtg	gagggcatgag	gggtgatatta	aaggggacaa	ctcagataga	aatcagagga
48721	aaatctcatg	caacagctca	taagtgtgtt	ggagtggagg	tggtatgtta	ttgcagatga
48781	ttttgaaagt	gccatatttt	caatacatcc	agattttata	catcaaaaac	gaagaaaata
48841	aaaaagcttt	ctttatgaag	cgtgatggcc	aaatgttttg	cttctgtttt	tcaactttta
48901	gatttagtat	aaataatttg	atataaagcc	aaaatgccta	tgatatattt	taccatggaa
48961	ctttgtaaaa	tatatctgtg	aggctgaatt	ctgatattta	agcaggaggg	cttccaactt
49021	aatgtgtgta	tacgaattgc	actctgagta	ccgtacagaa	ctaattgatt	atgcatttga
49081	agtaataaag	tcagtgaaaa	gatagtggag	ggtagagcca	gaatcaggag	aaacacttta
49141	aactcgttaac	ctatcagggg	aggtgtgtga	aaatacttgc	aaaatgctgt	gtggtttacc
49201	aaagcagttg	ttcttgatcc	tattataatc	attagtgtat	gtgtStStgt	gtgtgtgtgt
49261	ttgtgcacac	gcacgtgtgt	ggctagctac	atgcagaNa	gNgagcttga	atttctgtat
49321	gtctcttaat	gatcaagttaa	acctatgctt	gcatacatca	agctaaagcc	ccacaaaata
49381	tttttctaga	acctaacaga	aaacacagtg	gttctgtat	ggagttagca	atcgtgcctt
49441	tgccccctgc	gaagctcctg	cctcctaaag	gccctgtacc	tcccttagaa	ttgcagtgat
49501	tagggatcag	tgRtgggag	cttgacagtc	tggtgtgca	catctctctc	ttaactcttg
49561	tgctcctga	gccagtgctg	tctgtgcctc	agctgcctta	agctgtgagtg	agcacagacg
49621	ctctctMetca	cctcgagcac	atggggaaac	cttcttggtg	tgcaacatgt	gggaagaccc
49681	tttgggttca	ctgtcaccac	tgccactttt	ttctctcttc	actggtcttt	cttgtgtacc

49741	aagcatcctt	ctccatcact	ttccccaggt	cagttcttgt	tttgccatct	Yctctctctt
49801	ggatcattcc	agaggttctt	catctgtgct	gcttttcttt	ctgtgtctct	atcctctcaa
49861	ttctcttccc	cttctatggca	tcaactgtca	ttctctgaga	gggtgcaaca	ggttcccat
49921	ttatgagctg	atactgtctt	ccccaatgac	agctctcggt	ttccagctgt	gtaagggagt
49981	cagatatacc	ttgctgtagt	cagaaagay	gtttaaactc	tccaactccc	tggttctgtt
50041	ttttcttacc	ttgctgtagt	ggactctgt	atcttccaag	ttgtccaagg	tcaaaatctg
50101	gggtcatttt	atgctctccc	tatctctccc	tcagtccaag	accctaagag	tggccaagct
50161	ctgtggattc	ttccctctcc	gcccattccc	actaacgagc	tggtatggag	gggtgactct
50221	gcccacactc	tttctggcag	gttttcaggc	tcagatatac	ttgtgtccag	ttggagctgt
50281	ggtagagaga	gcaYgtccac	tcaactctct	ttgtcccatg	tcctctcttc	ttgggaatgt
50341	ggagggatgc	gacttctctc	caagcactgt	tgtagaatca	gctggaattc	tttttataac
50401	ttttttatgt	ttggaatata	tgcataatgt	tgtaataaca	tatggacata	tatggttaag
50461	gaacacagaa	ttctctacatc	acataacaag	tcattgtata	gcaaacactc	atggaactac
50521	cacttggtat	aagaaaaaatg	cattgctgtg	aaaactctgt	gagtgtcttc	cttgactctc
50581	ccctccgagc	aatcatcccc	ccaaacttta	ggaaagtctg	ttctttgatt	ttctatctat
50641	gtctatagtc	ctaataatc	aatttatatt	tgctgttttt	tgagttttat	attaagagaa
50701	gtctatagtc	tgctttattt	tcttaggtgt	gggggcttat	cagtgatata	ctgatatgac
50761	atgtagctta	gttcattaat	ttacgttccc	gtatcttaag	acttgaata	actaggtcac
50821	aatttatcca	ctgggctata	aatatgttgt	ttgcatttgt	ttgagtttgg	aactcttaac
50881	aaagaatact	gctatggaaa	ttcctgcttg	tggtctgtgt	tccactgata	aggacactcc
50941	tccaggaata	atcatgaaga	gtagagttgc	caggttaagag	ttctgcatata	acatttctat
51001	ataatgccat	acrgttctac	aatgtgattc	accgataatt	actgtagggc	gtagaaatgt
51061	aaactcccag	cttgacattc	agggcctctc	gatctactgt	ttcccactca	ttttccagtt
51121	gtcaccttcc	tctaccocac	agaacagaga	gccagatcag	agacaaaagt	gggtcttttg
51181	tgagctcata	ttgtgatgaa	gtaggtgagt	ttgagacaag	tgcaagaattg	tgccgttagt
51241	cagtgaggac	aggttgaaaa	gtctttttca	cccaagcaga	gcctctgtgc	gtttctcccc
51301	ttctgacttt	ccattggcctt	acagcagaaa	tgacgcctcg	cttagggcag	agacacagac
51361	tcagggtcca	ccccagagaa	aagagaagct	gttgtaagaa	gccttgaggat	tgcaggagtg
51421	ctcgaagtgt	ttacaactta	aatctgtccc	aaactagaag	tttagtctct	ttaactgtta
51481	atdatagctg	aagctgacca	atagcgattt	ccatcccaat	actgactgtt	tgaacttaatt
51541	gaagacactg	tgttcYgaag	gattctgagg	ccaagtccaa	gctcagagga	gctaatactg
51601	tgaccaggtg	gttaaacacct	gtcaagcttg	tgaggagatg	gagtctttta	tcccttrtgt
51661	ttttaagctt	tgcttcttaa	atcccttagt	tccctgcaat	gctcatttta	tctcaaaagt
51721	agagtatttc	ggttctggtg	acttagtttt	gtttgtcttg	agtttctagg	aaactaaccc
51781	ttttaaatcc	aaactctctg	ttggtttact	tggggcagaa	gctaaggttg	tagctttctc
51841	attttgactc	cttaYgtttg	ttaaagacac	ctccagattt	gaactcttatt	ttgtttttct
51901	gaagcagggt	ctctagaagg	ttgtttaaat	tggtgtgtgt	cttccgtgaa	ttcgtRtatt
51961	acttatgtct	actcacctac	tcagttgaag	gctgttagta	gtCaaatgac	agtgtaggtg
52021	aataccacca	ttaaccttta	acaggacatc	tagtatactc	acagtggtgt	ccccattatt
52081	ttctattttc	aaaccttgag	tccctctgaa	tgtattcatt	gatgtctctg	ttccaatttc
52141	attctctttt	agctYgttta	cagagcagag	ggcatcagta	ctctcgaagg	caatgagtga
52201	agagcccgag	aattttagag	catcactctc	gtctatgtgc	cagagctttt	tgcagctcca
52261	ttagtattgt	gggcatgttc	ttcttatcag	gacagttaac	aaaaccaaga	tctccaaact
52321	agcacaactaa	tattccagaa	caagagtcgt	cccaaggga	gaggtgtgca	tgtaacctc
52381	agaaagaatt	atacaaaagg	gcaaaagaag	gtagaggatg	aggaagcagc	aaggaactgt
52441	cttatgaYtg	aagtgagRgg	ttctcacaag	tgcccaggat	ttgatttggtc	accgggtgtg
52501	gggtgcagctg	Rtctatactg	gctgcattgg	gacttactca	atgaattaat	ttttttggca
52561	ccaaatgtgt	tcttagttat	tggtccatgt	atttaaagat	gtgcaaYagt	aaatgagaaa
52621	tcttgggctc	caagatgttt	acaacacggc	gtggcctagg	gcaggttgcca	ataagctctt
52681	taatgagtat	ttttatagcca	ctgtggaaaa	caattatagg	gttctccaaa	taaaatagaa
52741	tataacaacc	atatgatcca	gcaactctac	tgctggttat	atacccaaaa	gaagagacat
52801	tagcatattta	aagagatatg	tgaactccca	tgatatatgc	agcaactgtt	ccaatagcca
52861	agatgtagaa	tcaacctaa	tgctcatcaa	tgtagtaagt	gataaagaaa	ttctgtcata
52921	gagtgataact	ggaattattat	tcatccataa	aagagaatga	aattctgtcca	ttgtcagcaa
52981	agtggtgaYga	actggaggcc	attatgttaa	gtgaaataag	ccaggcacag	aaagacacat
53041	attgcatatt	tttactcatt	tgtagaact	aaaaaaaattg	actctatgac	ggtagagaga
53101	agaatggtgt	ttaccagagg	ctgggaaggg	tagtggtgaa	gcggggatga	agagaggttg
53161	gttaatgggtg	aaaaaagaaa	aatcagattt	gatagtagga	atagagattc	gtgtttggtta
53221	gcacacacaa	atgactatag	ataggaataa	tttatgttat	aatttcagat	aactagagga
53281	atgaatttgg	aatatttccca	gcacaaagaa	atgatgaagt	tttgaggtga	tggttatccc
53341	aattgcctctg	atttgatcat	tacacattgt	atgctctgtg	caaaatatata	cacataacct
53401	ataaatatgt	gcaactatta	tgtaactata	aaattttttt	aaaattaaag	gtctctagag
53461	gctcagaaaa	aaaaacccct	ttctctcccc	ccctctccca	ccccaccatc	cagtgaggac
53521	tgaggatga	ggaagggtc	gaagaaggaa	gtggtgtgtg	aggtggtgtt	taagaatggg

53581 gaggactttt cttctctgtct ctctcttccc tttttctaata tttttctcttc cttagagggtc
53641 tttcttgggt gtaagggttt gggtcgcggt gaggcagaag ccaagctgtt cttcttctgt
53701 gatgtgtgag aacatgtttt cagggaacttg aggttccaga ggagctgtgt ctgtctctgt
53761 cgcactctct gccaccaact taggtcata atactctgc aaatgactca tgaacacagg
53821 tagggtgtaa acattcttct tgagactctgt cctctgcgac aggcacccagg cctggaacagg
53881 aaatggacaca aaagatgag gtgagagttt ggctcttggt ctgtcttgtg ctagcagaac
53941 tgcgtgcttc cagaggggag aactgttggt cttttaagga tgaatggagt ccagctgttc
54001 aactltgaat gctgggga aacgttacaat tatgattgta atcaagaaMg ggcagcagaa
54061 ccagctggag aaggtgcccc atgaacatac tcaggcgcca cctctggaga tttctatggt
54121 gactcacagc aactggagc tgtgtgtttt gaagcagtt cctgtccagt ggtgtccatgt
54181 ctgctctcac caccggaaac tagggctctgt cagactttta ctctataag ttcccagag
54241 ctgactgttt tcttaacaat catggtgcag atcagattat tctgtcccca taccactttt
54301 ttgactttaa agaaatgttt aagcagtgcc ctcaatgaca tccaaaacct tctattttgt
54361 catcataaat gtgatctgta ttagtaaaagt atataatgga ctcttgtttt cattattata
54421 attataatta ttattatttt ttgtgttcta ttgtgactct cggtttttct agcttactgt
54481 ataggagggc ttatcgcttt ggtggctgtg gctgttctgt ttgtgtacat atcaacattt
54541 ttttaagtct acattgtttt ttggtatYcga agtgcctccc attctacaga taacatagta
54601 ggtaagtgtg ttaatacaat gaaaaaatgcc tcaaaaattgg tatctcttta gacatataca
54661 acgatattcaa atataacttt tcatattttta ctacgttgtt ggcaaaattta gggaaaggaa
54721 tctctctgtg actgcctgtg ctttagagaa atgattgtct cctaaatcacc agcatcattt
54781 ggctcagataa ggcttgacag ctcgtagtga ttgaggaat atttgctaag ctgcaggag
54841 agtatcatctt ctaagtctgt ctgcaacat gttacaaaag tttccacagg catctctgt
54901 ccaactgcggg aaagttttct cgaaaaccaa gtgctctcca tccatgatgt gctgtcagca
54961 cagtgggtac ttctcagaa tctgggtcat ggagagggat gaggtgcctg gggttggagc
55021 tctctctagc cctgtacttt ggtgcctgaa gRgatttaa tcttcaactc tcaactatgg
55081 agagagataca aaccaagttt gaatgtgact tctccactta cctcttgttg aaacttagaa
55141 agatgttttaa ctttcttcta ttctcagct atagaaagga atagaggag aggaagagga
55201 acaggagagga gaaagagaa agagagagag agggaggaag gaaagagag agggagggag
55261 aacggagagga agaaggaggt ttcgtagaaa agaaaactaa gaaagcagg gagagagatg
55321 gaggagagga gaggaaagga agaaaagagg aagggaagaa aaaaagaaa aacaagaaa
55381 gggacagtga ttaaatcctg ctttttgaca gtgggaataa ctgagltgaa gtacaggaaa
55441 cctctcagcg gggtcctggc cacaggcggt cctctattgc ttgtctggag ctcaaaaacg
55501 atcccccaaca ccacagctgt ggtttttagt ctgtggcctc atgtcctgcc agtctgttt
55561 ggcataagaaa tgctcagtg tgactcctgac tctctgagag cctggcattt cccacagtt
55621 tgcttgtgac tatgctactt ttgttttgtt ttgttttgtt ttgtctttaga acagatacaa
55681 tctattaagg ccttgcaaaa gtaataaatc tgctctaag tcccctaatt agatgaaaaa
55741 agaagcctgtg tgcagctgat ctgtgtggag atgcacgact ttataccttt taagtccaga
55801 ggctgtgagtg acaagagcag gaaaggagg gaaactggtt gctcgagaac gttttaNggg
55861 ccagctaaaa cataaaagag gtcactggca tcaagtgtt gctttgcaca taaaatacac
55921 agtaagggtt ttgcccacat Stttgataaa acgtggctat tcaataactt ggattttttc
55981 caaattaaat ttctgaattc agaattagca accctgagca atgtagaagaa cgataaactc
56041 ctttttaattg acaaaagtc a tctgaacctt aagtgccag agactcccta gctgtctcta
56101 gtactgtgga tagtccgacY gggcatgggg aggggggtctc tggtttttggc tctggactat
56161 gcagaggcgc cccgtctaa gcacacccat gactgctctc tctgctctgc gttctttaga
56221 agaagacagt tcagtcccc accactgatt gttttctgac acagagttga gtggttcagt
56281 tgcgttctac tttttgacta acagaagcct gcgtcacttt cgttactctt cctgactctg
56341 caggccccRt ggtgtgtctc tctcactgtc tctctctctc actgactctg tcaagtactc
56401 tctcactgag tcaatgcgac tcccaggagc gtgactatag tctgaactta tgggtttttc
56461 gcagtgtgtg ggggaagctgc tagtgaggtc gagtttagca ggaagagaaa accgaagtat
56521 tgactcacac ggagtgtggt gggctgggca gatgagagag gatgagagaa ccgcccctcg
56581 ctgagactgc gacgcagccc agattctgca acagtgggca gaggatttgg cgatggaggc
56641 taacaggcag ccaggggctc tttttttctt ttttttttct ttttttttct ttttttttct
56701 ttgtgtgact ttgtgtgtaa attctcYaca gctctgtcta cgagaactgc tctgtaatat
56761 ctctgtgtgt tggctttaac agtgagctac ttgtgtgatt ctgagattgt cccagatct
56821 ttgttatgtc ctgttcccc ttgaggatat ttctcagttt aaatcaggaa ataccgatta
56881 atgatgaaa atgagaaaga gagaataaat gtccttcgta ggataagctc ctgaccttga
56941 ctaggttagc taagctgtat cactcaat ta ataatagg gtgcataact caccatttta
57001 gaaggaagca ttgacagccc tagctgaagt cagcaagttc tgtatctctc ctgacgaagg
57061 actgagagct tacaaaatct cctggcaggg gtgcatgtgt gtcaggagat ggaagggtct
57121 gtcacggat cctctagaga gattttgaaa tgctgcctct tactccagat aggtctttgt
57181 agaattgtca tgtaggatag aatggctaaa acgaagacaa gccaaactat tNagattct
57241 aaagggaaac caaggggaca atgggaaac aagtcgggg agatttaat agatccattaa
57301 caattattaa aggtgaattt gcttttcaag ctaaaacaa ggcaatgaca agatccactg
57361 tgtgccattc acaacaacct ttcagatttt catgagagaa ctagctcttt

57421 atttccaaag gcagattttt ttccccccac agggagtcct catttcaaaa gggcatgggt
57481 tagggagagct tgactgcaac aactttccca tggtaaatgt ctatgcgtgt ttgtgttggc
57541 ttctttctcta gtgtttttcta tgcataattgg gggttaaacctt accaaaacct ctgcagttca
57601 gtaaaagact ttgctggag gccagattga atctgaattt tccactgtct tggttttcat
57661 aggcctcaaaa tttagcaata tcatatttgg agaaagtagg gaattgaata atcttttagac
57721 agttattact agatatgaat ttatgtgaat gagcttttat atattattgc caagctcaag
57781 aaggacataa caattttaag ggagtggaaa tagactctgc ttcttttcta ggggttggca
57841 aagttcttga aagacatgtg ggactggaaa tattgtctgg gctacttttg aaaaattcag
57901 actgacacag ctgcacagga ttaactcagg attagttttg tgaattttcc gctctccatt
57961 tctcatttta gtccacagaa aaggagcggg ggactgggt ttacatcaag tgactgcaat
58021 caccagctgg gagactttgg agagatcgca cagtcttgcgt ggtctcagct tctttactca
58081 taattttggg atagaacctat gtcccacagc gttgatcatg agaagcaagc cggggaatg
58141 ttgaggtggc gttgcctggc aaggctcttc aaaacagtg gactacaact tgactcttg
58201 ctattaatgt attggtcagt aaattatgaa ttagtcttt gaaagtgatg aaaaactcact
58261 acgtttttgag aacatcagca agttcttatt ctactcaaaa gcttagtctag accgaaagaa
58321 aaaaaagatg accaaaaaat tggggcacatt tgcactttt gaatttttca gaagtgtggag
58381 acttttctcc tactcaaatg tcttctgatc ctgaagtgg agagcaacaa gtactatata
58441 cctcagacag cttgttttaga aacagggaac agggacattt gcgaaagagc agaatcact
58501 tagtcacaaa ggtttgtttg ttgtttttaa aaatcagaaa cagttaggaaa aagcagaacac
58561 agatttgagca aagagagata actagtggca ggtgtctggga caagtggaaa taagcctgca
58621 tgtctcgtgt agtttagaat agaccaggaa acactgtatt taccagagag gtattatgt
58681 gtgtgtcaac gagcatcaac tcaaccagcc ctctacaga aaccaaaagga taatatatct
58741 cacatttttta agtgggaaaa ttgaatttct tctccaaaag ttcagaaaaa taagaaactt
58801 aaaaRtgtt ttctttccca ttcttatct atggaaaaaa aatcctctgg ttctcttctg
58861 tcaaatgtgt gctatgaaat ttacacagaa aaagtatcca ctatttttag cgggtgccct
58921 gatcagtgac ctttatgatt ccacaaggag ttctcagctat gttgggtttt tcccaattt
58981 agacacaaaat tagttatccc ttgttacct gccctgtgat cccactttta aaagctgagt
59041 ctgatctcag attcatcccc aacatagata taagctcttt gaagctccgt aagatcagg
59101 tctatttggg tattcgggtga gcaactgatga aggcctctct tgcgcccgt cctgtctcag
59161 tggcttaggca cagggcaggg agccaacgaa gtctccactc ttcacacagc tcttctcatg
59221 atgggggtggg gaggcagaca aggagtgtgc acgtgtgtgt gtcgactcgt gtatattgct
59281 acatgtgcga ccatgggtgt gcatgcatgt gcatgcatgt gtttttggct taccattct
59341 tgaagaagat ggccaagaat ggtgagcagg gaccgcaagg tcagcagtggt ttggtgtgag
59401 aattgatgga ctgagaaatg gtgttatgta aactgtcaag atctgtgca attttcaata
59461 ctattttttg gacgaaagct agaagaatac aaggttttcc ttctccctat taactttaa
59521 atcacctctt tctgcaagtc tgctcatcca acaaaactct atataaagga aatagaaaa
59581 gacaccaccc ctctctagta cctactaggc tgcctgagtt tctaaacagc ccaagctcg
59641 aaatcgctt ttccaatgag acgcccacac ttactctct tccactcaa cctctctgc
59701 cctgctgaag tcttatttca ttacagagat tctgagtag ggaattatct ctctctcat
59761 gccttctga actgcaccc ctgcaagact gtttaccatc cactcttaga cctctactt
59821 ttctccctca actctcccac cttttaaact ccaggagctc cagcctggcc aacataacga
59881 aacccctct ctctaaaaa tacaaaaaat agccgggctt ggtggcgctt gcttaatac
59941 ccagctactc aggagactga ggcaggagaa tgcgttgaac ctgtgaggtg gactgtgca
60001 tgagccaaga tggcgccact gcaactccagc ttgagagaga tgaagtgagac tccattctaa
60061 aataaaaaaa aaaaaataaa taaaaataaa taaaatccag gagcggctcc atgttcatg
60121 tgggtttttt ttctcaagaa ctccagacca ctctgtagat cttgtgttta acttctgtgc
60181 gttcgtttga ctctcgtcgc ctctgtagat attggccaat agcggggctg cttttgaggt
60241 ctgagctcag gaggcttctg tcatctcttc ccatctcttg tttctcttg ttcactctc
60301 tgctcaataa atactgatga cgacgacatg cgccattggg ttgactctct ctacacgca
60361 ctgcagatta cttagagctg ctcaattgct tttctcttg tttctcagat gtcagctgtg
60421 gggttgttag ttagtgaatt cactggtggg cctgaatcaa gaggagtgca tccattttt
60481 cctggttcga ttaggacagt gcttctgcat acaggacagc ctgagggtaa catggttga
60541 tggctagagt ttctcgtct ttgtttgttt attttagaga tcttttttca gttgtttga
60601 gagatgttgt cttattctgt catccaggct cactgtgcat gggagtgcgt ggccttact
60661 gatccctgaa ctcttttttt ttttttccga gacagagttt tgccttgtt tccagtggt
60721 agtgcgaatg ggtgtgctc ggctcactga aacctgcgc gcaggtgccc accacactgt ctggctaat
60781 cctgcctcag cctcctgagt agctgggatt gcaggtgccc accagctgtc catgactct
60841 ttgttattt tttagtagga cagggtttca ccatgttggc caggctgtct gactgagca
60901 gacctcaggt gatccacctg ctttggcctc ccaaaatgtc gggattacag gcatgagca
60961 catgcctggc cacatcctg aacctcctaa ctccactctc agctcctgca gtgtggga
61021 tttcaggcgt gagctatcat gcctggctaa ctttttgaaa atttatttct ttggagagct
61081 ttgttatgtt gcgagggcta gtctgaatt cctggcctca agctactctc ctgctcagc
61141 ttgtttatta cagccatgca ccaactgcgt ggagcagctc Yctgccttta atctcattt
61201 cgtggccact cacaggaggt ggtggactta gactcaaaag acgtggggta gggtagggt

61261	taagggattgc	agatgtgatg	cagcctaccc	agcctcagct	tcactcttga	gcattggggg
61321	taagaccacc	tcctccaggg	gtccatttgg	gagagagag	gatgtccctt	gagcggccct
61381	ggcacaacgt	cagccaactg	ggcactcaga	agtcagtgg	ccagggccaa	aggaccccat
61441	ggatagccgt	caggcttccg	gtttattaac	atgagagaat	ttggatcgaa	caattcccac
61501	agccttgcac	attccttttc	agatgggaag	ctgtatgacg	ccatgtcttt	atccccccag
61561	ccccacagg	aaagccagag	catgcctgtg	gatgcctgtg	tggttaaat	ctcccgccag
61621	gtgttgagg	gacaatgttg	atataagttg	tttatattcg	gcagagatga	atccccctga
61681	caaggtgggt	tttaagtgg	gtgtaaaaat	aaaaataaaa	agaagggaag	agcccccctc
61741	gtctctccac	tttactaatg	gcggtgactc	tgccctccct	ccccatggaa	ccacagagag
61801	ttctatccca	gcgccccctg	cccgctagcc	ccccagcccc	agccaagagc	gttagcccca
61861	agctctttgc	ctgctctagg	ctcctccctg	ccccagcgtg	ccctgagattc	ctgcttgcag
61921	cagcacccgt	ctcactttga	gtgaggatat	ggttaaagca	ttcacagaaa	caggtggcca
61981	gtgatgtagt	gggtgctaaa	ggactgaaag	gtggcgagtg	gtcatttgag	cctcacatcc
62041	ctgagatgaa	ctgctgggtg	ttttccatgg	gtttgaacaa	tgtaaaacag	gtcgtctcta
62101	aagcttgatt	tataaacctc	gacctacttt	gccccctccc	ctcccttaaa	ataatgggaag
62161	tttttgattg	cttttccacc	ttgataggaa	gggtgctttg	gacagtctag	ttaactttct
62221	tcaactcag	ttgtctcacc	tgtaaaatgg	ggatgggggtg	cttccctgac	tcagatgaga
62281	gactcagatt	agaaaacctg	agaagggggtc	cccgcatggg	agctcagcag	actttagaca
62341	ctcacacaac	agtgctttcc	tgctccctttg	ttctcctttt	tgaaagctca	tacagacaaa
62401	tggtcgaaat	ctgaaataaa	cattcttttc	tagtcaacaa	tgatggccaa	ttctactact
62461	tattcaacaa	atatttactg	aaaacctcta	tgtagaggac	agttattctga	cttagctaaa
62521	tatgaaaatc	agccaagcgg	aagggctctg	ctcaggggag	gttccagatt	attctttatt
62581	ccccatgag	gcaactgtat	actgaatagc	atctgcagag	ctgggtattt	agagaaaact
62641	ccctttccca	agcaatcacc	agggcatggt	atttggtttc	taaatattct	acttaatacc
62701	tggtcattta	aataactata	aagaaacaaa	ggaaaaacaa	gattcagaat	taatgcacca
62761	tttcagctaa	ctacattttc	ctatcctttt	aaaaactatt	tgtaaaacg	tggtctactc
62821	ctaatatata	ccagaccttc	agctagtctg	gggatcacaga	gttaggaacc	atcagatact
62881	gtttggccag	gaaaagtgac	atacaagaaa	accacatgca	aaacatgatt	catgactata
62941	gaggaccaa	gctccaggga	aagccacaaa	ggcttcacag	aaagggtagc	aaatatttaa
63001	aaaaagaaa	aaccacaaa	ttgaattaat	cattctctga	ctaaagctga	tttattttaa
63061	agtcctattt	tgcccgagg	aggtggctca	cacctgtaac	ccccagctct	tgagaggcgc
63121	aggtggggct	atcactttga	gtcaggagtt	caaacaccag	tggtggtaaa	accccgcttt
63181	tactaaaaat	gcaaaaatta	gctggacgtg	gtggtacgtg	ttctgtaatc	caggtactta
63241	ggaggtcag	caggagaaat	cgcttgaacc	tgggagtgag	aggttgagat	gagctgagat
63301	tgcatccctg	cactccaacc	tgggcaaac	agtgagactt	cacttcaaaa	aaaaaaagtc
63361	aattttctct	tgccctgttt	caaacattct	cactagcatt	aagaccggcg	ctgttttaat
63421	tgtagttctt	ctgagccctt	ctttctttat	ttccagccgt	ggccaagtgc	atcgtatgaa
63481	acgttaaagc	gtgcaggagg	ctgattgtca	ttgtggtccc	cgaaatcgctg	ggctttggcc
63541	tggtgaagaa	cctgtcagaa	gaacaaatcg	cggtctacag	tgccctgac	caggacggga
63601	tgaaggttat	tctcattgag	ctggagaaaa	tcgaggacta	cacagtctag	ccagagtcaa
63661	ttcagtatat	caaacagaag	catgggtcca	tcgggtggca	tggggaactc	accgagcag
63721	ccaggtgat	gaagaccag	ttttggaaga	cagtagagata	ccacatcgcc	cccgagaagt
63781	gtcgccgctt	tcctccggtc	cagctcYgc	agcacacacc	ttgctaccgc	accgaggggt
63841	agcggttggg	aggacacgag	gtttgtcacg	cactgatgca	gtgtctatca	tttcggtggt
63901	gctcacagct	ggaggaggac	acgtttcact	ggggccgtct	gctctgaagc	tgccagtgc
63961	gtactagtag	gaggaatctg	tggttttggt	gtcatttggt	ttctctgact	gtcgtgctt
64021	cttcagggaa	acacacggct	ctctgacaga	gcccccttta	gcctatgggc	ttattgacac
64081	atgcccaact	actgagccct	ggatggatag	agcacttggt	cccccttga	acaggacatg
64141	gagggtttta	gaaatggcag	tggaatgccc	cggaagtgtg	ccccatgatg	ggcaccatca
64201	gagctctaga	tggaagccctg	tgctgtcggt	ggaccacag	agggcgactc	agaccacaga
64261	gagggttgcc	aaggatagca	gtattttgct	acgctgtccc	agtgtctcca	ggggccccat
64321	ctcaggggctc	atttgcgtgt	ctcgcgtctc	ctcactctgt	tcagtgcaga	caagagactg
64381	caaacacagc	cttagcactt	tgcttccaga	agcaagttaa	aagtcaacta	gaccagtggg
64441	gaccacggcg	agtgcccatg	actgcctctt	ggctacccct	ccatgtttga	tgactgtttat
64501	ctgtcaaaat	aaagcaagca	ggaatWcctt	ttctctctct	tttagacaca	tgtcaaacag
64561	aattctgagc	agcctgtgag	agacgcaatt	agcacacaga	tgatagaaat	atgtctccag
64621	caaggcaaa	tcagttttcca	atgagccaat	gtgcccttgt	ccacaggcaa	tttataactt
64681	aattgattaa	ggtttttta	actaaaaatt	agctgtaaac	ccctcatcact	tttttccaa
64741	acccctggctc	gagggaatta	ggcatagctc	aaacctctga	agctgtgggt	tggtgacact
64801	gagacttagt	aagcagtcag	tgggggctgg	aaggagtgca	gccttgagct	ccagccggca
64861	ggggYgagag	agggagccag	aggggtctag	gagggcctgt	gttttagagt	ggcatgggga
64921	cgagggtRgg	ttaggaggtg	ctgtgcctc	gttcacagc	gattgtRgtt	acccagtggt
64981	ggatggactt	tcaggtgcta	aggaacccac	tcctgtcttt	gaagagttta	tggtccaagg
65041	tgacctacaa	ttacacattt	gtttagcatc	ctatggaggY	ctgcacttga	catgtgtcca

```

65101 ctcctttattt aacattttgct ttttaaaatt tttatttcggt taaactatat gaacataaaa
65161 ttcaccatttt taacaatttt taagtggcat cacactgtgtt gggggccatc
65221 accaccatcct attccagaat tgtttcatcc tctcaagctgt aaattctgtgt cccattaaagc
65281 tatccctccc tttgtcccttc ccatgtgcctt cccattgtctt ctgaggttagt
65341 catataaatt catttttaaga ataacagcat taaaaaatgt cttactataat tcat tactac
65401 tattcaatttt ttgtactcttt tcaataaaaa gaaagttagtg acacatgttgt gaaagttagga
65461 agcttttttga cttataaaaac tccagttttaa gaatttacc aacagtgtcgt tctccggaaa
65521 gtcagagagtg ctcagaaaaat accottttcgt ctgacgggttc agctttctat ttgtgtgaca
65581 gctctcgactg atgtcctgtgt agtgtgggtca ttcatttata aataat taat tgc tagagaa
65641 tccattttctt aaaa ttcaaa ggcacacct tcagagagga cactgtccccR tctctctccc
65701 actctcccaca cactgtggct gctctggctt gctctccatcc tcgagagggga aatggctggg
65761 aagggaagggg gaaggggtgct gagatgccct caaatctgaa tggggtgggt gtattcccga
65821 aatcctcacc aaaccacgag ccagtgaacca ctaccccttt ggggtccaga tcttactgcc
65881 ccgggggttag tcaagtggcc agaggtgggtg cccactgccct tcaggggggtt tcttgcgtgt
65941 gctgtggtctc acatgcactc cgcagagga aggacgaagc gtctccagcc agcccgcagc
66001 caccctgccc actccagcac tgcaggcagc ctccagagac cagcccagag aagaaacagg
66061 cagcgagtgga ggggacagag tgcggaacag atcagttaat cccattttcc tcttgggtgc
66121 aataggagaa acagcctggt ttaattaaac tagcgaatcc tcatgagga ataacagga
66181 tctagtgttga gagagaaatc gagatgcaaa gaaacttttt aaagtctYac taactccaa
66241 tgaataaatt gctgatcaat gcagcaagaa tacaataaat tgaagttagc tggcatcacc
66301 gctgacatgt aggcaggttg gcaggttaaca gctccgctca tgggtctcaag tccaattttg
66361 taagaagaag gaggttttaa agttcaacgg ctaagggaca aaaaagttag ttatgggaag
66421 gctgaagccc accctcaatt ctctcccggt tctccagctg ggcctggcgc aaat ataggg
66481 tcaatgggggt cctatcccta gcccttgggg gtggggtcca gaattctact caagcaaaa
66541 tgaagtccagt ttccaaggag ccagtgtgcc ttcatcacag gccaatttat aatt taatga
66601 tctcaaaaatt tttttaatc tatgaattag ctgtaaaacc tcatcactcc tttccaagg
66661 cctggtcttga ggggaattaga gacccccctg ggaatcccca gggactgacc tggaggtlagg
66721 gctgcgagagc gagatggagc cagagaggtg aaatacaggt gctgagtgcg tgggttactc
66781 ttacatttacc ctctccataa tgactgagtc agccacaaa cccactactc ttgttatctc
66841 cctcaaaata cctgagtgct gctcatgaga gaggccctgg gctcaagacca tgcacatgat
66901 ataaagggag cgggaaggtg tggttctttcc ccggaggacc aagcaagatg aagatataca
66961 tgtgaaaggt gcttggcaaa cYgtgggatg ccatgaggag ctggcctgcc aaaaatagaa
67021 atgtgctcag ggaagcctcag tccccagggc ccccccacac catcagcacc ccatagtgc
67081 cagacacctc tctcgccacg tcatgtttgg ttgaccttct cctggcaact tgcctgtgtt
67141 tttatttata aacttccctc taacacatgc ttgttttgta ttgactctgg gctgtgtaaa
67201 gtggaaaatt ccttctggt ttccttgaag aacagagcct gttccagatg aggtctggag
67261 tgagctacag aggtgtatgc tggccttagg agtgggtgct gctgggtctg aatgttagag
67321 gccacacatc tccagttaga atattattct gggagatggg aactctgtgt gttggtatgc
67381 cctcccatac acccaggaac ttctgagaaa tgtctgtgt cactaataca atccaccct
67441 catctcccag ggtgtccctg gagaggagct ctccacttga gaaggaacct agagccctgg
67501 ctcttgtcat ccaaaattcac ctcttctctg gggctcttat aggaagagtg agagtgtgaca
67561 ctgctcacct gtgctcctct ggcataacca ccttgcaag ataacccaa gaaatggaa
67621 gctccaggga tataccacca gatgaactga cggcaaggtg gaggttttcc gatccccatg
67681 cagaggtttcc ttatcagccc ccatctccca ccatcatgaa aaagagttca atagactctt
67741 cctgatttcca ggcacgaac taggctcaag aagaaagaag tgaactctca cgactgtgta
67801 agacttgtctg gactgacacc tatggctgga agatgacttt ttttgcctca tttgtctcta
67861 tctccacacc tattttctgc tgcaggatga ggtagggtt agcatcttag accccagatt
67921 gactgcagcg gttagaaga ggaagatggg atgaagaact gggccatccc catgtcatgg
67981 tgggtgagag ctggggccat ccccggtgct atggaggtgt agagctgggg gttatcccca
68041 tggctcatgga gggtagggc tggctggggg aggcataccc agtcactggt gttagagagc
68101 tggagatcac cccatgtcat ggtgggtgag atctgggggt atccctgtgt catgtgggt
68161 gaggcgggt ggtcatccac atggtcatag tgggtgagag ctgggggtat gctccataca
68221 tgggtgggtga gagctgggag catccccatg tcatggtggg cgagatctgg ggggtatccc
68281 cagctcatgg tggatgagag ctgggggaat caccatgtca gatcttgggt gatcttgggg
68341 gatccactgt catggtgggt gagagctggg gggatcact gtcatgtgtg gtgagagtgt
68401 ggttcatccc ccatgtcatg tggggctgag cccacttga agcctgtgct tttgtttgtt
68461 atgccccctt ctctgttttt ccaaatgaa caattaaact ttaactgatt aactgattcag
68521 taatttggta aataaaattt attctcat ttatcagttt aaataatgaa aactgattcag
68581 accatgcctg tcaaaaatcac aaacattttc ttatcagttt atttttcaac taactttcac
68641 tgtcaaaact atctgacaat tagctgttca atttttcaac caactctgta ttaggctatg
68701 tacctctgtg gtgtggtcca ctgaaaagtt gggcaaaaac caactctgta ttaggctatg
68761 agagaacact gagggctcat gacaaatagt tttttcccc acact tagta gtaggctatg
68821 tctcagctgc gacagccacc aaagctttat gctcctgatg atattttcgt cctctcatcc
68881 tctctgatgg cctcatttct ccaattttct tcttctctcc tttttttttt

```

68941 ttttttttga gacagagttt cgtttttgtc accgagggcty ggattacaag catgagccac
69001 cagcccgctg aagggctttc atatttttaa aacttgaag tacagtgaga aacataaatt
69061 agtaagaac tcagtatgca cacacggaaat ggaaaaagct ctgttctatgt tttattgtttc
69121 taattttgtc aagtctagct caatttttca aaatgctggt ccagcctcgc caactgtgtc
69181 taataaccaa cttatgcctt tccattgcaa tctggagagc tcagcctctc aggtctgtctg
69241 tccccctgtc ataacagata ctttggtctac ttgtcttct tcaatcaaca aggtctgtc
69301 aagaacttat ggctctttta attatctgac ttccgtgtca atcagctttg ttgtgtgttt
69361 taatgacca caggatagta gaagtgaaca taatttctct cctgtgtgaa aggatgacat
69421 caagaagaaa agaaagcagc tcactgggtg aaggaacctg agaaagagat gaacatttcc
69481 tctcttgaga cacaggacaa acaaggtcac gctcagctc ggcacaaagat ttgtctggg
69541 cctgcctacg gcgcctatgc gccctctagt ggctcgtgag gaaccctgtg ccagcccgaa
69601 gctcacagag ccccgltcag gctgcgcgaa cctacctagg cggccagaaat ggagacttac
69661 aggtggggcg gcatcccggg gtgcacacat tacctctctg gggtctcca acttaaggg
69721 aaggatactt ttcttctttt tgggtctgct agaaggtgga ccaaggggtg tgagttggga
69781 tgttcttaac tcttgggctt ctgagactgt cgcagctctg ccaaggtgga gatagtgaga
69841 tcagcagccc ctgtttacta tgtgtctcga agaggggact gcgtgtcag ttgttccga
69901 gaggttgcct tggcgctcgg cccctggact ccagtcacaa ctcaaccact tgcgtgagga
69961 gctctgtagc taatccctc ttgcaagtca aaaaacctgt ccccacgtt tctcctctgt
70021 aaaaaaggga taatacaatg ttggtatcct tattgccac tacaaaaagg gccagaaat
70081 attgaacagga catttacaaa gtaaggatta attcgtacaa aagcccggtg aacggaat
70141 gtgtgttaaca tcacaaatga tctgatgccg ccaggtaggg gggcattttac catgtccag
70201 acagacacta agctaagctc tttaagtaca ttactcatt aacagtcata tatctata
70261 cctctccatt ttaaaatgaa gaaagttaag gtgtaagaga ttagataacc caccagggg
70321 taacacagct gttagacatg gccccaggga agtgtatcac cgtctgggta ttccacgtat
70381 ttacagctatt ccttttaaat tgttaggcat gataatggtt gcattgttat gtttctaaaa
70441 gcatcttatt gttagaggtg gacatactga aacatttgtg atgtaaaatc tatgatgtct
70501 cggatttact tcacaaatga ccagtcaggg gagtgtgga ggacatgagt ttgtgaaaca
70561 agactgccca tagtgaaagt tcatctatga aaacatagag cagcttaaaa aatttttaa
70621 aacaaagaaa ctgcacaccc tcagacactt acgcaagctc tctgtgaaat aagacatcct
70681 ggctattctg aagagccgga tgaacttaag gatggagatt ttgttttgc ttcaaaaat
70741 taacacagct ttctctccct gattatttgc tcaattggta aatttatgaa aacagaaagt
70801 tataaaaaat ttcattatcc ttttggtgta tatatgaata ttcaacaga ttgtatctt
70861 caataccaat cttagattta tgaattgcgt tagtcagggt ttctataga aacagaaatg
70921 atatgacttt tatatatata caaaatgaag aactgtctcc catgatcagt gaggtcaga
70981 agggccacaa tccactctct gtgggctgga gccccagga gggcagtgaa atatttctt
71041 agttggagtc caacacctg agaaccagtg gcgtgatga tataaatccc ggctgaaagg
71101 cagaagatga gatgggtcag ctcaagcagt gagtgaagca gatcttgaaa aggggtgag
71161 aagaattcct ccttctctg ctttttgtt tctcaggccc ttgaagggtg ttggatgatg
71221 cccacctgct ctgggggaag ctcaactgtc tactgagtc attgatctct taactctggc
71281 ccgctgaac acccttacag acacgtccat aaataatggt taactctggc ttctttcagc
71341 ccaggcagat tgacataaa ggtaaacatc cacatggatg tttaggtttg ttctattgt
71401 tacttttaca acaaaagtgc attcatctga tcaattgcct tagataaatt agctgaaat
71461 gaagaattta tcttttaaat agatctattt atactgtatc atttgatgca ttctccaa
71521 ttccctcca gaaagcttgt accagttgtg actccacca atgtctgctg aagatctcag
71581 aagaacaaa cttattcaag gtgtccagg ctcaagcctg agttctcagt ttgtaaatga
71641 cactgggaaa ttcttgttt tataatattt ttgtgcattt caaagaatag taacaagaa
71701 ctgtgatggg atgttttttg tcttgaagga cctagttaata cactctctg ttcaaggtt
71761 tggctgtgca attcccagcc ccaactagtc cctgtcttgt atgtttatcc atgtacctt
71821 ctctgctgct ggtgattctc agtagggcac gttctcaagc aggcctccct aggggttgat
71881 ggtgcctagt cttccatcca gttggatgga tctcaaaaac ttaacagccc ataacacgg
71941 ggtggagaaa gctcagagct ccaaaacaaa ggggagaaac atctggcctt cccagttacc
72001 tactctagta gacaggtta attaaaaaca gaagcaacca acctcctctg ctgtgttat
72061 ctcttttccc agccccaaac aaggcaaaac aacaaaaaaa gcccatctg agactcagg
72121 tcttttgggt ttatgatctc catgtgtgtg gtcccagaga gaaagaggtg gaagagagg
72181 ggggcttgag gtcagcagcc tgcagtgga agctgttctc cgtgtaggag gctgaagctc
72241 cctaaaaagc agaaaaagct tgggatgttg ggcattccc agctgtctt ccatgtcact
72301 ctctctgatt tcaattcaac tatcacagtt cagacggcat agatactctc gaagacttt
72361 ttttttttga gatggagttc cgtctgtcca ctcaggctgtg atgtccgtgt ctaactctt
72421 gctcactgca acctccacct cctgggttca agtgaattca ctgcgcagc ctccaaagt
72481 gctgggacta caggtgcatg ccacacact Ygactaatt ttgtatgttt agtagagtg
72541 ggggtttcac catgtttgac agactgtgtc caaactcctg acctcaggtg atctgccac
72601 ctgtgctccc caaagtccca ggaattacagg catgagccac cacaccaggc tctagaga
72661 tttctaaagg ggaatgttg atctctgaga agcctgtagg tcttcttgta ggcacaaat
72721 tatctgtcca ttgaagtaag aaagccaagt actgtatgg ggcaggtggt gtgggcaatg

72781 gtaggacatt tactcccaga ccccatgctt gaaaaatcaat tctctttcca gttttccaac
72841 tttttctgtt taagcaacat cagtcagggt tcagaatgcc cacaaagctt tcttgattga
72901 atgatttaaat ggttaggctct atttttattct gtgtgaaatt taagggtctt tatctctcag
72961 cctttaccat ggccaaataa taatagcttt ggaaggtaca gctgtggcct tctctggaat
73021 tgaggaccct cagaacactg ctggaccctt agaccctcca cagagacttg cccatctgag
73081 gaagtagtgg aacttggaag caagagcaat ggtgagatt ctctgggtct cctctgccca
73141 agtttaattg catatctgtt gtatggcttc caagcaaggt taaggacaatt tggctcaatt
73201 tttattgttt ctataatcca acctagggtt ttgaaggaca aatatcaaac agtggcagat
73261 tttctgttcca gtgttgagca ccgggtgtcc cttcaggctt tgttcaaggc agtctccaaag
73321 agtccagtgg gcaacctagt gttaggaggt tgactgtccc atctctctat gctatagag
73381 caaaagatgg gctttgtttg gtttccctga aacctgtcct ctgtgaaaga gcaatcaggg
73441 atctcaaaag accaatcttg tacttccctc catgccacct gctctacttc caagccaag
73501 gtgcattgta gccactttag ggggaaatga gagaactcag gtagctattt agccataacta
73561 ttcaaaagtc ccaaaactggc cltttgtagt ttgttgtcca ccttctggcc cctattgaac
73621 acatgggctc cctatataga tacagaggtg agcatagagg catgtctctg cctgtatggc
73681 atgcatgac taatagatgg aggagacagc cacaaggaaag ggttggaag atggtctggg
73741 gtggaggagt gaggagatgc agagagagag caggaggaaa atcatggaag aaagccattt
73801 gatggagagc tctcttttct tcttcttctt taaaaaatgc aacacttagc caagcggtt
73861 atggtctgac tgactgtgac acccccagcc cccacttagg gaagagggcaa cagctccggc
73921 acctgtttct gacctagggt ccagggtgat gcccggtccc acacacatc aggcctcagt
73981 gtgggaaagc ggttcgggcca ggagccatct gggagcttga aacagagctt tgcctctctc
74041 tgagctgtct gttttcaatt aaacccatgg ctaaaacctc caccagcgct tgcatttgg
74101 gacattgttt tggcttattt agaataata atctatctgt gtttctctct ggtactggtt
74161 gaattgtctw tgggtgaaa cttagctgaa ataagtact agatcatgct taagtgtccc
74221 gctggccctg gggagggggt ggcggtggcg gtgtgctggg gtgRaggag gctgcgtctc
74281 gctttgtctga gacggagcg ccttgggaaa gaacggctct tctctcaggcc tRctctcg
74341 ctgctctctg ctgcccctga gggctgtctc gccacaacac gaacctctg gatgttccag
74401 gaggtagtct gttagtctga cctcagtgac aaagaaggga cctcaatcag caggcagatg
74461 agcagcttca agtcccaaac ccaagttagg gctccagcga tWgcccagc tgcctccacg
74521 gtagcgccct ggtgttttct ctctgcttcc taagggatt taagaagcaa ctaaaacct
74581 tgatttctga ggaagcaata aaaatgcagt cagagagctt ctaggagccc ggaattctaca
74641 tgcctctctc tgccctcaga aacacagagg aatgaatgaa taaagaaatg aactgtcga
74701 cctaggcttc aggatgtgat ggggtaaact ttggggtag Kcttttctag agatgtgcca
74761 tcaaggttag aagagtgtca aatgaatct cactttataa ctcaacacag cccatagact
74821 gttgtggcaa gtggaagaga ggtgtagcca ggttaattgag ttcaaggcag catgttagaa
74881 acatgat ttt ttttcccaa agtcaagccc ttttttcca ttagttagaa gctccctca
74941 gttatttctg ctaggtttca tagttttgca gtcactctgt gtccttggaa gactcatgtt
75001 gggtttatca gattcagctc tggttcatgt taaaacttta atcatttgat tccaagctt
75061 tcttttctc tactctgctc atgggagatg ggagctgaga ctagtgggtg gaataaagg
75121 ggtgatgggc tgctgtcaca cactgtctct ctctcccat ctctccacc tcatttggag
75181 cagtgagaga taagggaaaa aacctgtctc acatctttag ctacatatga tggctgtgcc
75241 tgggttacca caactgccat cctgtctcat tgcccaaggg tcacaaagg ttggtgtgct
75301 acacctctat gtctacaag Rggctcata ctgaggagag accctggcaa aggtggggtt
75361 tggagggacc cagctgtgct ttcaggggcg catgcagtggt gggcctcac atgcacact
75421 tgggggctgt tgctgttctt tgctggagcg ttctagctca gtttccacc agctgtacc
75481 ttcaggctct cagggtgctt ggggctccat ttccctact ttctaggaa ttcaggactc
75541 ggtggcatgt gcccaacttt gaggggagca tgcatctat gccactcca ttgggacaga
75601 cctcacaca ccaactcttc tcaagtctac tttctctag ttcaggagt cagggacaga
75661 cagtacagt aatctaccag ctaatcaggt gcacagcagg aatcaaaatc cagctccact
75721 tatttagtg cactcaaat tttggaataa ttctcttggg gatctccctc accccggctg
75781 gagtggagaa gaaataagct tttttcatga accaaacaca aaggcccaaa gacgaccgt
75841 gagctctcct catatgtgga gtgtgtgttc attgggtgtt ggtgtgtgtt ggggccaagt
75901 cctagggacat atccctctca tgggcttgtt ggctgtgtct cagcatgttct tgcctcagc
75961 ctcaagctct gctgaagatc tgaacaaga ggaagaatac atagaaaaat tgcacacact
76021 tttttctaaa agaactctgt gaaaccaaag aaaaaagaca atagaaaaat ggacaaacaa
76081 taaaacagg aatctaaag ccagaggaca ccaataatc acgaaccata gggagacca
76141 atctcactaa taataaggga catgtctata cacaatagt actgtttat atcttgcaga
76201 tatgcaaatg ttaaagggcc tggcaatgtt ggttaggtca tggggcagta tctgtcctg
76261 tctgttgaac ttactgtcta ctggtagaat cactgtggag agagcattta gccataatg
76321 tcatagctgt ttaggcaca tagcctaaag aagctctcat taagcctaat taaggcagat
76381 gcatcagat atttattgat gtgttatttg taactgtgga attttggag cagactaaat
76441 atgtctgtgg atgaagatc agagaagctg tgtactccc ccaaatccac tatattctag
76501 agtttaaaag gaatgaactt cagatacagt tatgacaagt ggttaacttc agaacgattt
76561 gataaaaaat tccaagataa tatgcacaa atttatataa gcttatataa gcaaaatata

76621 acatacaaaaa cagattcttaa gattgtctca caaggttact tgtgagttta tcatagttctt
76681 attcaacttcc agctttaaatg taggagtctt attctgggct attctgggct
76741 ggaacagctgt atactctgaaa caccaaaggc cattgtattct atgtcccaaa
76801 calttgtctt gtagacacaa acacagacttt tatatttgac aacataataa
76861 ctattgtctgt atactgtgtc tcagtttagac ctggcttctt atatagggac
76921 agtaaacattt tagagatgtc gaaaagctgt gtgtccttaa acatctctgt
76981 gtctactactc acatacattt ctagaatttaa aattttaaaa tagtttaagt
77041 caagagtattt ttattaatgt ctccaacagc ttcatccaca cacttgcaag
77101 ttgtattgca ttcaaatttg atggctgaga tagaaaggag acaaaaagga
77161 taggaagaaga gacagaattt gacatttagt gtgggtgctg gtgggaaga
77221 ggcaccactc tggggatgac gttacaattg tctttggaca aaaggacaa
77281 ttgtattgaa tgcagggtgtt ttgtctaaac atataacaa gtccacagaa
77341 gcatcatgaa atgggtgtgc tgaccactat agggattcat gttttgtga
77401 tgtgccagag agtggtctga caagccttta caagaacctt ctgaggtata
77461 tcttatatat caggctttag agagttttga tgcctttccc tagtactcca
77521 acccagggtt ggctgactcc aaaattcaat aaagccatagt gccctaagt
77581 ctctactactc atagtttatt cccggagaat gtgtaagttt gtaaatagct
77641 tatgacagct acattttctc acccttctct tgattccact aggaagctgt
77701 ttggtctcgt tgagtccatg cccaggcttg tccaacctta acatgtgaca
77761 ttgttaggca gctttgcaac acaggataga tgaacctaaa cctctggaga
77821 ctggattaggt tgggaaaaat ttgtctctct ttgtctctct tctctgaaat
77881 gtgggtatag ctttctgtgt agcagttctt ccttccaaa ggaatagatt
77941 aagaatgaat catgtcaaaa gtgaagagtc aaagagataag cagaatcaga
78001 gagaccaaga gagatctgtg acattgtttg agtccctgga tctgtcgtac
78061 ttggaactctc gaagttagg agttaactat ttctcatctc tgcttaaat
78121 tcttccaat gaaataatc ctacaacata caagcctcaa ttgttagtct
78181 gacttctctt tgattgatat cactgtagca atgtgaattt ttctatgaaa
78241 tctctctctt gaaaagaga ttaaaaagcc atactaggtt tggggtctct
78301 tgtttgcatg taaattatcc aatggctcaa aagtaacata aaaaatttat
78361 agttgccact taaggcatga aatccggcgc ctacgtccac tgcctggatg
78421 catcatctct ctcccaggct ccacatctga gcctgtaca gaggcagtc
78481 ctgcagtgct tcagcctgca atctgggcat tctgggttga ggggggggca
78541 tgcacttctc tggttttctg tctgtgtctg ggtctctctt ccttggcttc
78601 ggtgaatgag attccgaaac ctggcgtctc caggttacca ctccagaga
78661 tgggtctctc ggtgatctgt ggacctctgt gagggttcca cgtgataccg
78721 ttctgggtct gtagcccttt gaggtacagc tctgtctctg tctgtctctg
78781 tcttggaatca ccttctctctt ggggtgtccc gccatggcct tggcattgct
78841 cgatgcctct tctgtctctt tgtgctctct tccctggccc cgggtctctg
78901 gcaacgggtg cccacacggt ctccaggcta cagcaactccc acagccccc
78961 cccagccctt accccaacgg ccctgggaca cctccaggaa agggcttctt
79021 agaccgggag gtcattgggca tgtggttagg cctcaccctt gccagctgct
79081 cgacgacgag cgctgcttcc tctgtctctc ccttctctgt ctccggctgt
79141 cgtggttcca gaccaaggcc caccggggaag ccattgccaa atcgagctgt
79201 gctgtgagcgc cgacgggagg ccgagggtgg gtgtccgtgg tctgtctctc
79261 agccaggccgc cggggaccctt agggctccgt ccttctctgc ccgacacgg
79321 gggccctctg tgggtctgtg gatcgtcaag gcgcgtggg tggctctatg
79381 tagggcagct tctaaaagca ggggctgggc gggggtgtag ggggtagagg
79441 tgggaagtgg gcccacaagc gacatgaggc cggcagatgc agatcttatg
79501 cagggaagagc tcggcagggc gatgccaaag acggggtagt ggaacgggac
79561 agagacgggt agcagatggg gcgaaggagc gagttagtgg gacgtctatg
79621 tggcgggtcca gaaacggggg acggtagggg ggaagaagaa gccgactgct
79681 ggggtgtcgc cgagcgggag cgggggttgg gagcgtgaga gggggggcag
79741 attttcacgc agtgcaaaag tccctcgtgc gaacgctcgg atgctgcggc
79801 cctgcggcgc ttttatctcc tcaggggcgtt cagggcgaca acgtccttgc
79861 cccccctgaa gccgggaagc cctcgcgaat tggcacaagg ccccgcttca
79921 gcaacggggg aaatggaa gaagggaat tgggggacat agcaacctat
79981 cctgtagttt tgcctcagtt aggcgaaggc tgatcagagg cttaggatac
80041 cgggggctctg ggggagcgcc tctgagcagg atctgggaaa aggggagcga
80101 caggcacctt ccttaagac agcgcagcgt tcaaacctct tcagctctc
80161 ggaacacgtc gcaattagac atgctaggtc cattttacc atgggacagg
80221 gagggaactt ccataggctg gcgggtggtga caaagcaggt ggggctagaa
80281 gagaaggcag taggagggga aggcacaaatg cccaagcgc gcacacgcg
80341 ctgcattgct ggacgggggt ctgcaggggg cgcgtcagag cagcagctggg
80401 tctaccctgt gtccccgtat tcttgggttt gaacttttac tctttaaatt

80461 aatcttttaaa tattttatttt atttcatttt agatttcttg gtacatgtgc atgtttgtta
 80521 catggatata ttgcataatg gtgaggattt gcttcttagg gtacccatca ccaaaatagt
 80581 aacattgtac ccaataggta ttttttatcc ctccatacca tcccaccctc ctccattttg
 80641 aagtccccaa tgtctgttac ttccattctt ttcttcata gtactattgt tttaagctttg
 80701 acttttaagt gagaacatgc agtattgtac ttctctgttc tgagtatttt ttacttagat
 80761 gaggccctc agctccatga tgttgattca acggacatga ttctattctt ttttttgctt
 80821 atattagattt ccttaccata tttcttltat ccaatcaact gtggctggac attttaggtgt
 80881 gtctcatgat ttgtcatltg tgaatagtgc tgcataaact atctgagtac aagtgctttt
 80941 ttttaagttaa tgatttcatt tcttttggtg agatttcccaa tagtaggatt cgtgggtcaa
 81001 atgttgatgt tctttttagt taattgagaa atctccacac ttttttccat agaagttgaa
 81061 ctaattttaca tccccaccag cagtgataaa gcgttctctt ttctctgtgt ccttgcgttg
 81121 ttttttttag tttttattaa cagccattct gactggtgca agatgatac attgtgggtt
 81181 taattggcat atctctgatg atgagttagt ttctatgtgt ttgttgccg agaaacaact
 81241 ttttaattgat ctacttggca taacctagcc agacaaatgc ttctatagt tatgaaagcg
 81301 gaattaaatt tgaaccaata aatgtcataa tctctacta ctccatcact tctcccact
 81361 cctagacaca taacttttag gaataagtga aagagtggg gctgatccct aatgagcag
 81421 tgtggagcag atgggctatc agtgggtctc ttcaaggcta ttggtggtgc tagagaggaa
 81481 gggcacaccg aggaaggggc tggggctgtc actggtacac ttgggtgtgt ctgaggtgc
 81541 tccaacaaac aagaacaagc caagcaacca cacaatagg gggtaagcac agccatgctt
 81601 tgggttaagc gggcatatgt tcatcaaaaga cctctccacc ttctctgact ctgaaagact
 81661 ttgccagcat tgtgagcaca gcccgctcgt gtctccatctg gggaggtttg gatcgctaga
 81721 aaattttctt ttcatacctg acatgcccaa ataaagagag atctcttct ttctctctt
 81781 taaaaggccc tgatttaaag actgcttaaa tcaacataga tgaattagat aagtcattat
 81841 gcaacaatgc ttttccata atgactcaat ttctgaacat ggtgtgactt ggtgggttgc
 81901 gttttgctct ggtgttctta aggaggggag cttagggcaa tgcactggga cagctctaa
 81961 attttgctct ttcttttagc tggaaacatg tctagaact atcagatgt taccagatt
 82021 tcttttttgc ctgtgttga cattgctgcc taagaataga catcacagta cgtctgcga
 82081 aacacacaaa aattctgctg ataatacaca ctgttttcta tggccaggaa agccctgat
 82141 gctcacctgc taccaccact gaccaggtgt gaattcacag tgaaggggc aagtttgtt
 82201 actcctagtt gctcttgaat agagagttga cttttccac ccttggctt gtaactgtt
 82261 agtctactaa taaacccctc cttttaaagg gggggaaaaa aaaaactaatg agaaatata
 82321 ataggagata aagaagaatc ataagaacc atgttggaag ttcaaaaaga acscgttga
 82381 ggtctaaagg ctacagaaaaa tatttagatc actgatgcta taatagattt aagtaaaaa
 82441 gacagggggc acaagggta acattctaga atattttgaa caataaaaa ttatgtaagc
 82501 cacttgaggc caccctttct gctctgcata tctcaataga ggctctactt ataaacgYtt
 82561 tttaaaatct ctgggcttta aatttcttta ttgccaattt caaacagatt attgaaatc
 82621 gactgaagaa taagcttata aacatcccta gtaatatct catatttgtt ttaaaaagta
 82681 ttttttagtt gagatcaata aactggtttg aagtctaagg ttccaacct aagtaagca
 82741 tgaactctga aaataactca attaagaaat aagtagaaaa gatttcaaca taaggcaata
 82801 aaagataacc tcttccaca gcgaataatc accttcaacc aaagtttctt ttcttgaat
 82861 caacttttatt atgttttaatt ttcatatggt gtagggaagg caagggaatt ggggcatagg
 82921 aggtcagaga gaactttctg qaqaatgtga tccccacata aaggaatgtc ttggtggg
 82981 ggtggatggg gtggaggtgg atgtggccga agactctgtc tccacagaag aagaagcata
 83041 aaatcatgag aagtggtcag agccccacaa agacttcaat ttctcaaaa atgaagtca
 83101 gaaggaagag gggactagaa ggtggaggtt ggggtgaaga actcaagaac gaggagagg
 83161 aagaggggtg gggagcctgt aacagcgaca gctggagaaa gacttaagtg ttatcattt
 83221 taaagattt ctctgctcat aaatacttga aaaaaaact gaaaatgcaa aaagcaciaa
 83281 gaagtcaccc ccaactctg aatattagca taacacaga ctattttgt cactttctg
 83341 attttaaac ctgacaatac cagccaactt tatcgttata ctttgtgcta gttttgtt
 83401 actctttttg ttcatctatt agtgtcttaa gtttctatt gtcttattg tttaattgt
 83461 tgaatttat gctaacttcc atttttatgc ctctctagaa agtactttt acagtgtact
 83521 caatattttc ttaataatcc ttaataaac cactatagat cacatagact tctcttaat
 83581 tttcttttaa atttcttctc agaaatttgt ttgtttgtg tattggaat gttttttcc
 83641 atttttttt ctcatagtta ctccaggct gatgaatcc ttgtttttc ttgtttttt
 83701 taacttgtca actgctgttt attttattt attggcagat ttgtttttt tatatttgtt
 83761 atcataaccg gaatagttaa taaacttgtc tttttcttc cattatttgt tatatagca
 83821 cttttttctg gtctaatttt tagactgtct aaaaatttgc ttgtttgtg ttaattagga
 83881 catattctcta tggttttact cttagctatg atgttggctg ttttttttct tttaataat
 83941 ttttaatttt ttacatttaa attgttttaa atttaattgt ctcttaggtc tagtgacta
 84001 aaagctttaa gttttgaaaa ttgttaattg atttttcat aggaagctct ggcataatt
 84061 aagatgata tatgattttt cttcttgac ttttttgat gatgaagcat atgatgata
 84121 tctctgata taagccatct ttgaatttct ttttaattt gatgatacag ttgttataat
 84181 tgcttcaatt atctaattt atttggaaat ttcatattta ttfgcaaatg aatttcaaga
 84241 taaatgttta cattttacta cctgtctctg gctgctgtgc caagttgtgt

84301 gactcacacc tgtaatccca gcactttggg aggcgtgaggt gggctggatca cctgaggtca
84361 ggaggtcaag accagcctgg ccaacatggg gaaccccaat ctctactaaa caaacaacaaa
84421 caaaaacacac aaagaacaaa caacaacaaa gtacgcaggc atgggtggcag gccactgttaa
84481 tcccagctac ttgggagggc gagacaggaa aatcgcttga acccaggagg tgaaggtggc
84541 agtgagctaaa gaaagcaccac ttgcactcca gccctaggta caaagagttaa actclgtctc
84601 aaaaaaataa aaaaaaataa aagaaaagaa aagaaaatlaa gctgcctctaa taacgtctaaa
84661 tacaaccttt ttcaclctttt aataagctct gccagtgcta atataggctg gaaatatttt
84721 ctctctttaca gtagtgaggc caattactgt agtcaggtae tactttttgt atttacttta
84781 aattatatttt gttattttcta acacattttat tgatttgatt cttttttttt ttcttaataa
84841 taaataaag ttggglaatt tactctttac tagaataat gacataataa tttcttaatt
84901 aattactataa tggagataata atctttctaaa aagcagttaa ttgtcttgaa gtatatttgt
84961 ctgtttttca tctctaaact ttgtttacttt cactttcaact tctcccctct gtttacttaac
85021 taggcagaga tgccattttt accatctacc ctctattcca ccttgaattta tcaactgaaa
85081 caattttctt taaccaattta attttatctt taagtccttc tccctctttt ttttcaagtt
85141 tattttgtac tctcatgatt gttttctaaa ttctcaggat aagtcattag caacttctat
85201 caaatacttt attttttttt ttttaagaatt aaacaattgc cctccagata cctgtttgpc
85261 tgtattccca aagtttgcta tgcagcgttc ttctgggtat tttattataa ttgagatatt
85321 taagttttga tttttgattt ttgagtttca ttttaacaa ttctgtntgc ttcttttttt
85381 cctagcgggtt cagtttgttt gcatgttaaca ttgttaatta tttctagcta taattctagg
85441 ctctgagaaa acagagtcctt taccatctat aatataatgt taataaacct ctctggcaat
85501 ctactgtact tctactggca ttagaagcaa gatgataatt tctcatattt aacttttagt
85561 tccagtttcc acattctcac atttctttac tcccaattg ttaactgtat gggacaatg
85621 tgagccaaag atgacgggga cataattgag gactcagttt aatgtgtcgt tggcagagag
85681 caaatgtaaa agggatcttc accattagcc ttgtctaccc ttctcccctt cgcgcgttag
85741 ggctgtgaag ggtactgtca cctcaggggc aagagatgat gaggattttg gctatagggt
85801 ttgagatttt ggagctctgt tgaagtga gaagtcgtag tagtgcctag gtttcaactt
85861 cctgtgttga agaccaggg agactgtgac agtgaggggt gagtctcagg gagggtgatt
85921 gctacccata caagcaaaag tgctctgga gggcacact aggatatac agaggagct
85981 ggggtccccc tcttggtgtc tgggaatgag acgtgggtac gagtctgag agtgaatgcc
86041 tctgtctgcc ctggtctgtc tggccallag caalggcaat algtggagct actctctctt
86101 cttagggcaa tcaacacttt ttcccttttt cccctaaacc taccctctca aggaagacca
86161 tgtttgtgtc tcaaggggtg tgtgactttc taaalgagga tggcccttca gtaaaacca
86221 tgtgattttt tatcttaact tatcttacct catagtagaa actctctcca ttttaaggaa
86281 ctctgtctag cacacaact caagttcaat ttctgggtag ttctccctgc gtaggtctac
86341 tcatctacaa agaataaaga aatatttctt gcatctttat ttctctttat gttggggcca
86401 caacaaaata atcacattta tgcctttaag ctctcaactg caccctagtt gatgttctat
86461 ttgtatattc ttctctaata ttgtMgtgac ctgtttaacc atctctgagc actcttttcc
86521 taaaatgtac attctcacac aaagctaata tcccatlgcc taltaaaaag tatccaaaaat
86581 ttattgagaa gaatgtcatt tgcatttaaa aagtcacact ctgtcctggc aatctaaagc
86641 cctctccctt talctgtctc ataattctac ttgtctatcat tagttctttt cagctaaatca
86701 tgtctcaggg gacatgatga catttggcaa ctggagatca gtttcatagga ggtcgggctg
86761 tttactatct cccacaatgt gcagaaacagc tggcccccac acaaaagaaa ggtcgggccc
86821 caatgtcaat agttctgagg ctgagaaaac ctgtcttga caatgagga aagggtgccc
86881 ctcaagaaca cctgggggat tcccacaaaa ttgatttgat tggcccaat cctgttttag
86941 cataactgtc ctggaacaga gtaagtctat cctctgaat aggttatctt cgtttctcca
87001 aacacactta actgctcttt cctttggctt aattatata ctgtagaatg ttcttcagga
87061 atggcaattt tctttgattc tctctacat gcacactctt tcatgttagg ggtctcttt
87121 ggggaagata agtgatgtga gaagcatgca gaagactctg cactgtaccc agagtggtag
87181 atctctccat aaagggagtc tactctctct cctttttctg tagttttaagc attttggaat
87241 ctgagggcat gccctatgca actcacagca acacaggag gcaactatct acaggtctac
87301 ccagtgagct attcatacta aagtaatact tcttttcaat tccacatcag gagttagtaa
87361 tgggattcag taacaggcaa gtaaacactc caaaaccaca agtatctctt gagagcaga
87421 aataacagag ttaaaaaact tcttttttga gaacattgcc tttctcagaa acgaaggtac
87481 taaaactcact ttttcttgta aagtgggat tgggaattac taggttatgt tacccttctt
87541 tcaagctctc taaaagacat gtaactctcag acatggtctc aagctgtgag taggttatgt
87601 ctccacaaa acacatgcag gtaactctct ccatgtgctc aagctgtgag taggttatgt
87661 tctcacaaat ttacaccttt tcttlaRctg aaataaatgt aacctgaaat caacacaaa
87721 tccaaactgt tcttactgtt attcactaaa ggttcttga acccaagat taactgattt
87781 tgtgtgctact gggaggtatt ttcaattctt ttctcaaaa agaccaggtt atttgaactg
87841 taccatcagg gtgatttttt gtgtaaaatt ttcttaaaat gttctcttaca cccacacat
87901 acatagttaaa tttatcaggg tctctgttat tatctctctt tctttgtaaa gttagactta
87961 aaaaataata agttttgaaa tgaacaaaat gctgtgaatt gatgtgctg gttgtgttc
88021 tctatggaat aagaagaaga caagcgctct tttaactgtt ttgtcttaaa cagtcttcat
88081 gcttagaata tgaattttaaa ttaataatcc tagttctctt actcataaatt aacttgaatt

```

88141 gattactact taattttcca cctgaatata tcaattttctt ttcttttatt ttttggatgc
88201 attttttatt gtgtaccttc catgggtcaa tttaggaag ttatgtacct ttttgggcc
88261 ttagttttctt caaatccaga gtgagggggt ttgactacat tagtgggtctt caaacctgac
88321 tgcacagaat aattaaactga ggagcgttag gaataacata atgcccgatt tcttctgagt
88381 gagaccaccag gggcagatca actcttagat tattttccaac cttaaaattct tgctctctga
88441 caataccocat tctggcgagg ctgggtgaat tggcgagcca ttgactccaa ttgactccaa
88501 tagcttgggt attccagtgg cccgtttcat tacaggtatc aaaaaattct taaaaagtaac
88561 ctaacttttgg gcgcaggcat gtgcttcaca cctgtaatcc cagcactttg caagctctaa
88621 gcaggaggatt tgcttgagcc caggagttcg agaccagcct gagcaataa tggggacctg
88681 gtctctacaa aagtttlaaa aattaaaccag atgtgatgga gccggggata caaggacctat
88741 agtgagccat gattgcacca ctgcactcca acctgggtga cagacagagt gataccctgt
88801 cacaaaaaaa aaaaaaaga aagaaagaaa gaaaaagaaa aaaaaagaa agaaaaacaa
88861 caccataatt ttgaccctgc agttctactt ctaggcattt attcttaaga cagtattaat
88921 ggtgtgccag atacttagtt ataattgatg tgactccagt gttataaaa agaaaaaaaa
88981 tgaaattcgg taatatltaa ataaatttat gtacacgat acaataaaat atgatcgaga
89041 cattaaaata atgttaaaga aaagtattta tgtcatggga aactatttat agtaaacac
89101 atgaaaaatt ttgtaattta ttttaaaatt taataattgt gccaggcaca gtggctcatg
89161 cctgtatacc ctgcacttta ggagggccaa gcggggcagat cactggaggt caaggttttg
89221 agaccagcctt ggccaaacatg atgagacccc atctctacta aaaaatacaa aaaaattagcc
89281 ggctgtgggtg gctgcgcctt gtaatcccaa ctactcggga ggctgaggtg gaagaactctc
89341 ttgacacctgg gagggcgagg ttgcagttag ccaagatcac accactgcac tccaactggg
89401 acagcaagag tgaaactcca tctcaaaaaa aaaaaaaaaa aaaaataata tatatataa
89461 taKaataaata tttgtaaggt tatagagcaa aatgatgaca aaggttttag ttggtggattt
89521 caaagtaatt ttgattttct tcttttttgg ttatgttttc tttagtactt tatattgctt
89581 taattaggtgt tattttaaaa tcatctctcta atctagctcc ttctagatat gcatgtttaa
89641 gccttaaacct ctctctacR cctttgtgtc ccaaactgca cctctatagt ctagtactac
89701 aaatccagagt ttacaagaag tactgaactc aaaccagcaa acatgggtgg gctccactca
89761 gggtctctgac ctaaggtcat cgaacacaaa tggaggaggg agttcttta tcaagatga
89821 aatccaaagac aaactgacat aagtgtctta taattgtgta accaggagtc aggactcaaa
89881 gggaagtccc aagccaggag gaatgcacag agccctccca acccaagtga ctacggagaa
89941 tgagaaggttt tcccctggca gagaatggga ggacaagaag ctgtagagat aatgggaaca
90001 taacacactga tttcttaagt tacacggcat atttgggaaa atgtagaagt ttggcccca
90061 gtgtcagaata tgaggtataa atgcattgtg tgaagaagaa atctggggaa gtccccagcc
90121 tactgttacc tttgtgtgaa aagaagaagt cctcctttgc aggaaaaagt acctcccttt
90181 ctgagcagac tcaagctcag cccaggtcgt gggacgaact tagtgattgg aggatgggtt
90241 ggggttttagt tgcacttgc tccatcagct ggacacactc ctgcagtga ctcaagagca
90301 aacggctctct accacaatgc tgtgaggtaa ggatacacag ctcaaagaag gtaaatattt
90361 tgcccatatt ttgagcaagg acatgcaccc agagtgaaga ctcttaagca atgaatgtgg
90421 acatgattcc atgggctgtg ggaaccattg ctggttattg agggagaaat gaaattgaat
90481 gcactaagac tagggcacac atggagaata aacaggaagc tattgaaccg tcttggttag
90541 acatgatgag acctgaattt ggacagtggt agtgaatgat gaaaagaagt gaagaagtgtg
90601 atggatattt tttaggttag atgagtgaat ttgcaggtga ggtgaagtga aagggggag
90661 aggaagaact ggcttgatatt ggggtctgaa gccatcgcca tttgctgata gtgaaattta
90721 taggaatttt tagagactct tagaaagaga aggaagagca gatcctaga aatgacctat
90781 atttaagagg aatcagtgaa tgaacccaaa aatagcaatc agagtgaggg aagggacaca
90841 aagaagaagg tagggtgtca tggaggccaa gagttagagt tcaaagaggg agtggtcaaa
90901 gtgtcaaatg gcaaccagtg agaacagatg agagctgaga agatttcat agcgaagtgc
90961 tcagaaaggca atccattacc ttaattgagc agtttcaacc ccaaggttcc agggggttag
91021 ttgtgtgtgg gggcggtgaa ggctggagta gagctctttt gtaagaattt gggttagagaa
91081 aagaaggaga gaggcagggc agtggtttca taggaaattt aggaccaggg aaggtcttag
91141 ttatggggc atgtgtgtct agaacatgct tagagagcga gtgatacaga catcactatc
91201 tgaagctgat agatacagac gtcacaactg agacatagaa gaaccttga atgatgtg
91261 ctgcatttgg agctgggagg attgagaatt caaacctaga acacaagtga aggggctgag
91321 ttggaaaagg aggcattgct tctt taggaa ggaggtatgg ggaataggga agagtgagg
91381 gaaggtttct ggaaacgttg agttgtgcaa gagaggtggt gatggtgcac cagcaagagt
91441 cctttttctt aatgggttag aatatgagac agtggtctat agcaaacagg atcgattgtg
91501 attttcacat ctgagccaaa tagaacatct gaaaagatgc ttttctctgt tccaccttgc
91561 aagcttttgg ttagttagaa ggtcaactcag aagtggtgga cgcactctga ctcgagttg
91621 ataacttgag ttgttttagt ttgtgaggag aaaaagtcat ttatcttgt tccaccttgc
91681 attcccgtga tataacacag tgcctgcggc agcagatggt caataaatat ttgtttaatg
91741 gatgtcttct gtactttgtc taatcagtaa aatgaggtaa ttcttccacg cacatattc
91801 tgcacccatg gagaacacaa aattagggaa gggggccatca caaaggccag caaaggccag
91861 gtcattttgc tctgtatgct ggttaacatc cccctctatc actttcaagt tagtaaaag
91921 ggagatattg cactctgggt tcaagacatc ttccacttgc agtcttttgc ttagtttctt

```

91981 gttctcaaac ctgtccacca agctcagtc agtccatcat acgcacagac aatttctgtt
92041 accttggtgt ggggtgcat gaccagcac ggtcggatg ggtatggatg aagcatgggc
92101 aggggacctc ccaccagctc agcagacctc tgaggcccat ccagatgccc agtccctggga
92161 ctgctcttca ttaggggctg cctttgggta tcccttttgc aaataaagat ttctctctga
92221 tagttttcag ttacccttta atttctatcc tgtaattcta tactatctata ttctcttttg
92281 catcatccag gtctctccac tcaaccccca ttctttttct ggtctttgaa gctcgaagac
92341 ttttccctgt cctgggggtct acactggctt gtgtgcaaaa catltggccc agggagccat
92401 ggtcttccaa aggtagctgc ttgttccctg agctcatctt acatgaaat gactgaatct
92461 caltttccata aggggtatttc tcaaccttgt tcaagtttcc ttgtgtgagtt tacacatttc
92521 caaattgact tttagggcat gattctctct attgaatttc ctggagagct cactgataac
92581 tcttctagca agtgagtgat tctccagccc ccttttctta atgcccagctt ggtatgctct
92641 ccggctattct ctggactcac acctccaccc ccagccctctt gcatactttt taactctttt
92701 caggttcata gcttttctgt tccatttga aggtcacatt ttagaatttc cgtatgtgct
92761 tagaatggaa aaaaacaatg gctgattttt ctactgttt ttctgaaagc caatcatat
92821 atacagatta tggcaccacc aaatgacagt gtccacaca agacagatgt taagaattcc
92881 tctgtatttg aggtcagagt gtcttgcaat tttaataagg aggtctgtga ctctccaggt
92941 gtggaagctt atttattggg tcatgtccat cactctgtga gtctttttcc tctctagt
93001 ccatgacgca qcaggctaga gagaagcgat tcacgtagt ggtgaagaca ttacattttt
93061 atgtgtctctg tgggtatgag agtttgtgca gcttgggttag aataaggtga gggcagggtc
93121 ggtgtgctcat gctgttaatc ccagcacttt gggagggcga ggtgggttga ttatgaggtc
93181 aagagatcaa gaccatcctg gccaacatgg taaaactcct tctctgttaa aaatacaaaa
93241 aattagccag cactgatggt gtgtgctctg agtcccagct acttggggag ctgagggcag
93301 agaatgtgctt gaacccggga ggcagagcgt gcagtgaagt gagatcacgc cactgcaact
93361 cagcctgtgtg acagagcgag actccgtttc aaagaaaaaa aaaaataaga taagttaaat
93421 tgggccaagg aaaccacaga catgccggtt gtatgttgtt gttagtgtaa actcaaaagt
93481 ttgaagaagg gctctttgccc tgtcctcatg gtgagcttaa aaccacacc tctctctgta
93541 tggttacataa atgtagactg ccagtgacta ctgtcctct tgccacaaat aagactgaaa
93601 aggcattact ccagtgagg gaggccagta tgtgacagtt catcctatct ttgtgacagc
93661 agatccctgt ctgtattaat ccaactcagg tgccataaca aaataccaca cgtctttgtg
93721 tgtaaataac agttcggttt cctctgaggc ctctcctct ggttgcaga cactgctctt
93781 ctgtgtgtgt cctcatgttg tcttctctct gtgtgttccc atccctagtt tcttgctctc
93841 ttatgagagc aaagtctcta ttgggttagg attatccac ataagcttat ttatcttaac
93901 ttacatcttg aaagcacta tctccaaata cattcatat catataactt ggggtttagg
93961 attccaact gtgaacttgg cggagacaca gttcagctct cactagccc ttagtggaaat
94021 caagagtgtg ggcctaagta gcagagtggc acagaggaaa aacaccagccc ccacacacca
94081 gtggtcatgg cattgaaaac attctctccc atgactctgc cttaccttga ggcattctctg
94141 ttaagtgaat taagctggct acaaaaagac aaataccata tgattccat tgcgtagggt
94201 ccttagagta gtcagattca gagacaggaa atagaatggt ggtgctctg gccagtgtg
94261 tgtataagga atggagctta ctgttcaatg gatgcagagt ttcaatttag gaaatgaaa
94321 aagttttaga catggatggt ggtgatggtt gcacaacagt gtaagtgtac ttaatgctac
94381 tgagctgtac acttacaat ggttaagagg gtcaatttta tattatgtat tctgtctctc
94441 accaaattttt gaaaagggtta cgagctgcgg aatcagacct gaggtttagc atttgtctt
94501 ccttcaacaa tatgcacaac tctttatttt tctctagtaa gctcagagtt ttgtgaactgc
94561 aaaaagggaa taatgtttcc tccctgggga cttaaaggaga tcttgaagctt aagatgtttg
94621 ataaagtctt ttgtcatata actagcattt ggccaatgat aaactaataat agtaacaagt
94681 atagaagaag aaaaatttca gggttcaagc agatgatggc atttgccttt gattgtttt
94741 tctcttctat ggggtcaagt aaactggaac ctgtcctggg ctgcagaagc taagatcagc
94801 cctctgtca catcaggggc cctgggact aagactaaga agctccgga cgtctccaa
94861 ggggttttct cagcactctc aaaagagtat gttgtctaat catgcaggca gtaaatccaa
94921 aacatgtctg gaagagtltg acagtccag atgacactct atgactcttc ggtctctct
94981 gctcttgctt tccacagctg ctcaactgggt cctctgctgg ctccaagccc agtccctgca
95041 gggcacagat ttggaagaac ttggcctctc gctgggacat gttgtctgcc agtgcagtg
95101 gttttgaggg cccagatctg ggcccatgga agcttcaagg tctctgctct ctccacact
95161 tctctttccc tcttccctgt ccatgtgtgg ccactctctg agccctgagc atctctcag
95221 tccaggtctt tggctgtgga ctgttactgc caccctgccc acagtttcta agagcagcc
95281 cagcagctga caaattcac tcaagtaagg gtttattggg ataltaaagaa atgcaaatgt
95341 tttgtgataag aatgcaaccc agaacttcca ctgtatacta gaggagtggt ttgcaaac
95401 tggtcgaag caagaattaa catctttggg tcttttctct ccttcccata tgaggttagg
95461 tctgtataga ggggttttgg tgaatcctga gaggaaact tcttggggaa ggcaggggtg
95521 gagaagggcct ggaagctgg actggctgg gctgttctgt agaacatatt gctgtgggt
95581 tcttcttcta ttgtgggcac caccctttaa tgccatact cctctcagg ctccagaca
95641 tggcatcgcc cctgagaagt ccaggtggac cctgtgctct gccttgggg caggctgct
95701 tccctacccc ccatccaYgc aggcacagct cagtttttga aaggtttacag cctcagtgga
95761 tagcgaggag tgctaattggt gcaactgcct atgggagat gttggatgga

```

95821 Rtgatccctg aatgcctccc ccatggccct gacagttcct tgcaccatgt gtgggggcaac
95881 ctttatagcg cctccagcct cctgagctcc ttggttcaag agcaactgag ccacagctag
95941 ttagaagaaa agcctcctcc caggcctgct gacctccatt cacaggggca cggagggttc
96001 cttgggcttg gagtaagatg gttctcctg cctccaagcc tcttatgag

```

WASP1P genomic sequence (SEQ ID NO: 3)

>2:175603701-175699600

```

1 cccccaggg cctcggacac agatataaac cttggtgcag ccagcagtg gggatggaaa
61 tgaggagaaa aaccagactg ggtaggggcg ccatctgctc tgacacacca cttggaggggc
121 tctcaggagc cctcggggcc caggggaaaag tgttcttgga aacttacagg tgtcagctga
181 atgtcagttc cttttctctc agttcccccRt gagtccagttg tgaagatggg acaactcgtc
241 aggttttggtc gagggtggca cattcctcgc ccttttgag cttggttgga gcggaaaact
301 ctgaattgct ccacacactt ggggtcaaga gatgtgcacc ccttttctct gccctctggga
361 tccctctctc tttgaggagc agcgtatctg tctctcctgt gaaacagttg cttccattgc
421 tttctttctc ggataattcc atttctttcc tgaagagcca agaactttct ttttttttct
481 tttttgagat ggagctctac tctatcacgc aggtcggagt gcagtgccgt gtttttttct
541 cactgcaccc tccgctctcc ggggtcaagc gattcctctg cttcaggctc ctgagtagct
601 gggactatag gcgaacgcga ccacgcctgg ctaatttttg tattttttag agagacaggg
661 tttcaccata ttggtcaggc tgggtcttga cctctgacct catgatccac ccacctcagc
721 cttccaaaag gttgggatta caggcgtgag ccatctgcgc cggcccaagcc aagaactttc
781 aaaaagtcct gttgaacttt tccagggaca gcttataaaa cacacagaag tttctgagagc
841 tcatctactt gacatacaga gactctgaaa cctcagagca aaagcgtagt tttctttcca
901 gagaggaaag caggaggaaa agcaccctct tcttctatca aatattgtct caatagaaat
961 aagaacaggg cacaaattac cacatcaata atttaccctg ccccactgga tcccnaatcc
1021 cttctgggact aacttagaga gccttgaaaa atttccctct cagcccgctg tctcagctac
1081 aaacggttgct gtagctgagc ttacaagaag atttgacta ggaatagaaa tagctatttg
1141 tgaagctcaa tacttagggt tctaataagt atattttctc tttctttttt cttcataaga
1201 ggaattgcct gctttcatgg aattataata tctgaattgg gtggctcaga ttacagggtg
1261 ctgagaacag aacattgtgc tggggggggg ggggtggggg aggggagagc aagtggggaa
1321 ggagcagggg ggggttccca gaggcttgct tcccctctc tttgcgggga ggtgaggagc
1381 aggactgggg ggaataggaa ggagcaggct ggggtcccca aaagcttgct tcccctctc
1441 tttatgggtc ttgacaggtg tcttaggtat tggaggcccc cttgtattct tcaacttgct
1501 cttccaaact gactgatcac taaaattacg tggagaactc taaaacattc ctacccccgc
1561 ccttctacgc ctttctctc tggctaagaa tctgattcag tagggctggg taagatgagt
1621 gaaaatgctt attttttaa agtccccacg tgattctgat gaccagtagt gtttgattta
1681 ttattctaaa atacataaaa tatacgtatc tctaaaatac attcctgact gaagctctga
1741 tagtgaaaaa tatgtccata ttatctcagt gagggtgcata aagagatagt cagggaagcc
1801 atgagctgcc ttgacttccc agaagggaag ataactctgt gccactatca aacccacagc
1861 gacattgtgg catacttcat aaagcctgag tctgtatttc ttttctgtga gaaaatttct
1921 atcaagtgag gaaagatcaa agcctaccaa gtgccttgct cagtagtctc agctcgtctc
1981 cattcccaaa cactttcatg aggggagaact tacttttttc ttttcttttc ttttttttct
2041 ttttttgag actccattgc actccattgc ccaggctgga gtgcaattct gcgatctcgg
2101 cttctgtcaa cctctgcctc ctgggttcca gtgattctcc tgctccaccc ccccgatgag
2161 ctgggactat aggcacacgc caccatgctt ggctaatttt tgtatttttt agtcacagca
2221 gggtttttga atgtggcaca ggctggtctg gaactcctga cctcaggtga ttgtcccgc
2281 ttggcctccc aaagtgtctg gattacaggc atgagccacc gtctcctagg ctaggtagac
2341 ctttaattag taatttcttt ttatgtgaaa gtaaatcata atgaccagaa acacttgaaa
2401 ccttttttct ttctctatat tctctctttt gttccagtta ttggaacctc ggaagacctc
2461 acctctctaa gatgcaacct ctgagcattc tgggtttttt tgtttttgtt cttgattttt
2521 ttgagacaga gtacactctg tgcagagcct ggagtgagtg ggcacaactc actgactcag
2581 caacctccac ctccagattc caagcaattc ttccgcctta gccccctaag ctagtgggag
2641 tgcaggaaag agccacatg cctggctaat tttttgtatt tttagtagag taggttttct
2701 accataattg ctaggctggg cttgaaactc tgagtccaag tgattctgct gcccttgctc
2761 cccaaagtgc tgggattaca agtgctgcgc accagcccg cctctctgat gacttctgat
2821 gagagaaaa atgagagtaa taggcctgag gactgtgaa tggtctgctga gaggctctat
2881 ttgaagccgg ttaactagat ttatttccca actactagat tagatcagca cgtgagaaa
2941 atgagaattg gagtttggc ggaagagagt ttggggaatc aaaaagattt gggagcattt
3001 aacattttaga gaaaggctca ggaaggccag aggcacagga agcacctgta cccagctgag

```

3061 ggaggaagag ggagggggcca gagactaaga agatccacaga ggtagaagaagc ttccaaaat
 3121 aataattatt tccctcaagtc ccttatgggt cttgccagcc ttgtcccatc ccaactttcc
 3181 ctcaagctctct gtctctctct catcctggta gaagtgaaga tcaagctagt ttcttgagct
 3241 agtttcaaaa gccacaaagt ggaagtctag gaacccttg gatgtagta tcaaaatgcc
 3301 caaatgtctc tacagctttg tgcccttgta gagatgctt agtggggccg tgctcaagga
 3361 tctttccaaa gcattctgga gcttgaggga catcttcatt actccatttt taataaaagc
 3421 ttaaaataatg tctgtctatg ctgtttgagg tgtgtgtatg cacttttgcat ttgttaaatg
 3481 ggcctgggata ctgaagtcac gttgaaacaa aactgtctca ctactgttaa gttgtttggg
 3541 ttttgagttt gctgtcattt atagcaggca aacaaaatct aaaaattaa gtttccgtatt
 3601 ctaagtgcac tgaattacac cttttcaaaa ggaacaaagg atgtactgaa agtgaataaa
 3661 tgattgcagg gcttcagaca ccaactttta cagcaccagg tagtaaaaaa ttactagatt
 3721 tttttttttt tgtctaaaaa gttatgctta ggcaggcgcc agtgtctcac actgttaatc
 3781 ccaggacttt ggagggcaga ggcaggcgga tcacctgagg tcaggagttg ggaatcagcc
 3841 tgggcaacac ggtgaaaccc caccctactt aaaaaataa aattagccgg gcgcagttgc
 3901 acatgctgtt aatccagctt acttgggagg ctgaggcagg agaactcatt gaacctggga
 3961 ggcggaggat gctgtgagct gagatcgta cactgtttt ccgctggggc aacaaagatg
 4021 aatctccgct tcaccaaaaa aaaaaaaaaa aaaaaaaaaa agttatgctt aggaactcct
 4081 tggatagaat taacattcta taacctataa cacttatttc agttgggtta agtttactat
 4141 ggggtactta gcataggata gtccaggaga cttttctgca ttttcttata ataagtatg
 4201 tgatatacaga agttctcaact tccagcctgc tctgtgaagt accctcttga taacactgtg
 4261 actgggtgac ctggagggaag cagatggact gttccaggga gctgtagggt cacatcactg
 4321 tctgtttctg cctggggcca tgaatcccca aactgaaagc agtggcccca aactgtgtac
 4381 tgagtctcac aggtattgtt acctgacttt cctcttttct ttaattttat tcttttctat
 4441 tctcttttgt aaaaaatga aataactttt gggaggccaa ggcaggagga ttgtttgag
 4501 ccaggagttc gagaccagcc ttggtaaacac agtgaagccc tgtctctaca aaaaacttga
 4561 aaattagcca aattattgtg catgttctgt tagtccagc tctcagaag gcgtaggcag
 4621 gaggtacaga caagcccagg aattcgcgcc tgcagtgtac catgtattgc tcaactgcat
 4681 cgcactggg gtacagagtg agaccctttc tctaaaaaca acaaaaaaca aaaaaaccaa
 4741 atgtataaaa attgttattt caaaaaaaa acagaattgt ataggaagcc ccagagtaca
 4801 catcaccagg tctcccaact attattcaca gccaggcatt tctcacttcc acttctttac
 4861 tcttactgga ctttttggag acatttgagg taaatctcag atgtcatatt tctgtcataa
 4921 atatgtcagc atgtcctctt aaaaaaact aactcttita gaagcataaa ccaacaatcc
 4981 tttactcctt ctaaaaaat tgacaataag tcttaatat catcaaatat ccagtcaggt
 5041 ttaaatcttc tcaactattt tataggtgtc attttacaat tatctgtttt gaatcaggat
 5101 ccaaacaggg tccaaacatt aatcatttta atctataaat gctcctcttc ttaagtacat
 5161 tttaatctaa gatgctccct ctcttttttt tttagacag agtctgtctc tgtgccccag
 5221 gctggaatgc agtgccacag tctcagctca ctgcaacctc cgctcccggt gtccaagcga
 5281 ttaacctgcc tcaactcctt gagtgcgtgt gattacaggg gctgcccacc agctcggct
 5341 gatgtttgta tttttagtag agacagggtt tcacctgtt ggtcaggctg gctcgtgaat
 5401 cctgacctgc tgatctgccc acctcagcct cccaaagtgc tgggattata ggcattgacc
 5461 accgcaccga gctcctttt ctgttattca ctaagccagg tcaatttgtt tggatttttg
 5521 tgactcaca cccatgggtt tggtttaataa gttgctttct tccctgact tctcgttagt
 5581 tgggtgttag atctagaggt ttaactcgat ttgattttgt tttttggcaa gaacacttta
 5641 tagttggcat tgtatacttc tgtagggaag cactttgtct atctcttttt ttgtgtagtt
 5701 agcagcaatt aattatcact gtctagaata tttcttttct tcaattttga tccacctca
 5761 acccaaccaa caagttacac accccttcag acccctctc caacaccaat ctctactttg
 5821 tactgtttca actgattaga aaatgattta ctgagggcgg ggtgtgtgtg ctacagcctg
 5881 aaetccagc actttgggag gccaaaggYgg gtgattcacc agaggtcagg agtttgagac
 5941 cagcctgttc agtatgtgtg aacctgtct ccaactaaaaa tcaaaaaagt agccaggtgt
 6001 ggtggcgctg gcctgtaatc ccagctactc tggaggctaa agcaggagaa gactctgaa
 6061 ctgggaggtg gagggtgcag tgagctgaga ttggcgcaat gcactccagc taggcaaca
 6121 agagtgaac tccatctcaa aaaaaaaaaa aaaaataaga aacagaatgc gttgattgg
 6181 tcttaaatct atttcacaga tacagctccc cccacttaca cagactat tt tctgtgtg
 6241 cagtggtatg tacatagagt tttctaagtt cactatacag gctatagc accctactat
 6301 cctgttttaa gtgctggtag ggctcctccc tttctcctat cactaatgag cactcttgyt
 6361 ttgaagcttg ggtgttttct ggggagctct tttatagagg tgcagttggc cctctctgga
 6421 cctttggcct tcaggtgatg ggtcctccct ttttagcagg tgtccaggat gaaatttgaa
 6481 catagaggca agcctttagga ttaaaaccga tcaactgag attaaatagg agaatggaa
 6601 ttttgaaatt tctctctgt caacaaaaa gttcccgagt tccgaactga atgtacaagc
 6661 tagcaagca gagccaacct gcaaatgccc taccctcaca ctctctatc taggggatta
 6721 tgaatttaat ctactttagt tgaattactg cagctgcmaa caaccagca tagcaagta
 6781 ttaaatcaaa ataaatctat tctatgttcc ttttccataa atatttaagg ctttgatgga
 6841 gagaagaagc caatggaaac tgacctgag ttttccataa aactgacact tcttgatgag

6901	accctaataag	agctaaaact	atgattgaga	ttgcacaaag	cattgaatca	tcaaaaagtaa
6961	cgtattataga	tgtcatatat	taaaaaaact	cagcttttgg	ttagatataaa	gttgaaaaag
7021	cacacagcaa	cttaaaaagtg	gagatggagg	cttagaaact	tctatgttgg	tgaggaggga
7081	tggaaattaga	attttttcca	aggattattc	tcaaagcaca	taactgagaa	ttagcttttg
7141	gtgttggtcaa	taaaaggaaga	cttttctcct	attacgatat	gctgacacata	acacttctat
7201	taaagttaagg	aggagaattg	gagttttctg	atctctcctc	ttgcacaaaa	cagctctccc
7261	gttttccaat	tgaattgaca	agatttagcaa	cgagagagat	gaagattttaa	gaaaaaaagt
7321	atgggctggg	tgcagttgct	tacacctgta	atcttagcac	ttttggaggag	cgaggcttga
7381	ggatggcttg	agcttagagg	gtcaagacca	gcctggggcaa	catagacaga	cccttatctc
7441	acaacaataa	caaaaattcR	ccgagttggg	tgggctgcac	ctctgaagct	aggacttctg
7501	gaggctgaag	tgaggaggatt	gcctgagctc	ggagagttcaa	ggctgcagtg	tgctgtgatg
7561	gtgccactgc	actctagctt	ggacaacaga	gcgagacccct	gtctcaaaaa	aaaaaaaaaa
7621	agaaaagaaa	agaaaaaaag	tatgatgttc	aaaatctatt	taagagggag	ccatagagct
7681	tgagaaagca	gaggatagct	gatgatctgc	ccctgtcttg	ctctgtcttc	tttattttgt
7741	cattccccca	ttgtgttgta	tggaagcaaa	acatcattgt	tttactgtgt	agtagatgac
7801	acctttctcc	ttgcagacaa	gggtgtgaca	gcaaccgggt	ccagggaagcc	ccctgRtaaca
7861	acctttcttt	gtgtgtgtgt	aggaagctat	ggctcataag	tgaMctcag	agattttccca
7921	cccactacgc	tggtccctcc	aactcacaga	gactcattgt	taagggctctt	acctctgcaa
7981	agctgctggc	gcttctgggc	ttcattcaat	atgaagatgg	tgatcaagca	ccccagagct
8041	caaaataact	gtctctatgat	cagaccatgg	gtcagcccat	ttgcccgtgt	ctctgatgat
8101	gaaagtatga	tcactgtcac	catagaaaca	cgctcccaaa	cttctctacc	ccatgttgat
8161	ttttcccca	tcacttcatt	gttttggata	tcactttaga	ttgtggccct	ctctctttctg
8221	ccagaagcaa	aattccccca	tggtgtctaca	gtagaatatgc	ccctctcttca	gggatactgc
8281	ctgaaatcct	atttcgtcaa	ttaaaattag	acaaagtatg	gcagagacct	agctcccttt
8341	gaaaagctac	ctacctaact	agatttccaa	gtgattttaaa	cgctccattat	cacaataaag
8401	ttcaaaagct	ttaaagatgc	atgaagtgat	gcattcaagc	agcttgaacat	taactgtctt
8461	ggaaaagtca	ctggagggtg	gaaggcaggg	ttagggttca	gctttttaga	ttagataaaga
8521	gcaaaagaca	acttcaaaac	tcctctgggg	cagccttgct	gtccaccagt	gtggggcgag
8581	cagtgggctt	actgtttctc	ctgacactgt	ggctgtgtgt	accaggccac	agaaatgtct
8641	agaaatctgt	gtatcttcta	tgtgtacttag	cccgctgagt	catagatcac	agagggtgac
8701	aggggtgctg	tgtagactgc	cttttcacga	taactttcac	gtagattctaa	tgtgtgtggc
8761	acaccagatc	gatgcatttg	caaccacact	ccgtgtccac	agcgtcaaaa	catgcctctg
8821	atgccaaaga	gaatgtttgt	atttgagcat	aatttttcag	ggaggcagKg	ctttgatttt
8881	ccgtgatttt	ttgtgtttca	tttttttaac	ctgactatgt	acgaagaata	tttacaataa
8941	aatttaggag	aggatagaca	atccttgggt	gtatggagac	agggaaatggc	tcccgccagc
9001	tgaataaata	gcattgcattg	atctggcttt	ctgggccccta	cccaagcctt	tttacaacta
9061	ccaggtgttt	tatagacaca	tttttctatg	aagttagtcaa	actgttaaca	gcattgaatcc
9121	tgaatgataa	tcgtgtctta	ataataataa	aagaagaagaa	ataagagaca	agcatcacga
9181	ttttcccaat	tgaattgtct	tttggtttgg	cccttgggtgg	cacaggggtca	aggggtgtgg
9241	ggcattttgt	tgccattcac	tattctttca	acctgtcctg	attatggaac	ccctttaggt
9301	ccgtccactt	ggaaccacgg	tgctctgaga	ggacgtgtaa	ctcacagcag	ccccacacaa
9361	attccagatga	tactactgca	atgtttttga	cacagaaatc	taggttttgtt	gtgttaaatgt
9421	agcatcatct	tttgttttag	caattttgtga	acagctttgc	ttctctctac	accttaaatg
9481	tcactcagat	aaggatttaa	tcgtatgcac	ccaaataacct	cttagtatata	aaacgctctg
9541	actcagtagc	gtttctggct	gagcaggtgg	aagaaggccc	acgttgcgca	atgtcatgag
9601	gggcagccat	ctttaaccct	cacgcccaca	tcaccagcct	gttcttcttc	acaaagagaa
9661	gttgttccca	cttctcttcc	aggtctctca	gattcttggt	acaggttggg	aaagagacct
9721	agagattatt	taggcataaac	gtttcatttt	ataaatgaca	aaattagggt	tgtgcaaaa
9781	gtgtgtattt	tgctgtgtga	aagccaagaa	aaaaaattag	agcctcttaa	aaagtcattt
9841	tcctctgaaa	taaaagtatc	tgatttcaact	gttaaatata	gttctctcat	tgtgtgcat
9901	aatcaaccac	ttctcaagaa	aactctaaaa	gcgtgtattc	ccatagacaa	catttcagaa
9961	tattacataa	gaagctctca	ccaagacacc	aaggtaaaaa	gttaagagct	agccaaagac
10021	aggtgcacata	aaaaataaag	aaatcttcaa	aggggaaaga	aatctcaaaa	gtggcaacat
10081	gacacacctc	attctctgcc	tactttcag	gtaaagcagat	gttgaagtct	caggagggct
10141	cagtataata	cacctctctc	ccccctccag	gtcctgcaca	aattgaaaaa	ataaaagtga
10201	ccagatggac	tcaaatgcct	cttctatgac	tgaggtgcca	agctggaggg	caggagtgtc
10261	ctctctggctc	tggttttaggc	tgacctctctg	aacggggcct	gaggcgaggc	ccacacgggc
10321	agggatgcaga	aggaagctgg	agagagctc	agaaaggagg	goggcgaggc	ctctcttgctg
10381	ggcccaagaa	aaagcctggc	atgttagagc	tggtgcagga	ctctccaggg	tgaccgagga
10441	accagaagga	gggaaaagcc	attctccata	acaaaaagtc	aggaacggct	gaagagccct
10501	ccagccctcc	cacctctctt	cgcgggggct	tcttcttgag	gtcttcccce	ctctctcccc
10561	gtctctgttga	gtgtgttttg	gtctccctct	atggcctctg	cttggttgctg	gttggttgctg
10621	agagaaagag	agagaaaggg	agagacagag	agaaggctta	gtctctgtcc	aaacgggcca
10681	ctctagggga	ctctcagctc	tgaacgggag	aaqacagagt	ttagggcaga	gctgtatcaag

10741	ggaacctcaa	caaacacccc	cagccatgga	ggcggcggtg	tctttgaaga	ccccatgaga
10801	gacatacaaa	agggagagag	gtaacttttaa	ataccacaac	gtacgccagg	agaaagaagt
10861	ggggccctctc	agacgatcaa	taatttaaga	gctttttccc	tcttttcccc	ccctccctcc
10921	ctccctctctc	ctgctttgag	octggaaaca	atcatgtag	caattatggc	cgagagagat
10981	agtaaatggt	ctgcaatttg	tgggttcttg	gtcgcactga	cttcaagaat	gaaccccggt
11041	accctcagct	tgagtgttac	aattcttaaa	agtgccgtgt	ccgaattttg	ttctctctga
11101	tgttcggagt	ttcttctctc	tgggtgggtc	gtggctctgc	tggtccagga	gtgaagctgc
11161	agactctcgc	agtgcagcgt	acagctctta	aggtggtgtt	cttggagttg	ttcttctctc
11221	ccagctggctt	catagttctg	ctggctcaag	agtgaaagct	cgacactctg	catgtagcgt
11281	tacagctctt	aaggtgggtg	ttctggagtt	gttctgtctc	tcctggtggt	tgactctctc
11341	gctggtctga	ggagtgaagc	tgcagacctt	ccgtggtgag	gttacagctc	ttaaagccgt
11401	gcgtctgagg	ttgttcgttt	ctcccgtgtg	gttcgtggtc	tcgtgtgctt	taagagtga
11461	gctgcagacc	ttcacggtga	atgttacagc	tcataaagcg	agtggtgacc	taaaagtgga
11521	gcagcagcaa	gattttattgc	aaagagagga	agaataaagc	ttccacagtg	tgacaggggg
11581	ccccaacagg	ttgccaccgc	tggcttgggc	agcctgcttt	tattgtctta	tctgcccaca
11641	ctgcacacct	gctgattggt	ccattttaca	gagagccgag	tgtctgtttt	tgacagggtg
11701	ctgattggtg	cgtttacaat	ccctgagcta	gacacaaagg	ttcttccact	ccccaccaga
11761	gtagtctagg	acagaatggt	gattggtgca	ttcacgaacc	ctgagctaga	ccagcgggtc
11821	tgatttggtg	gtctacaaac	cttgagctag	atcacagagt	ccgatttggt	taatttacaat
11881	cccttagcta	gcataaagg	ttctccaagt	ccccaccaga	gtagctagat	ccgttcttga
11941	ttggtgctat	ccaaaaccgt	gagctagaca	gaggggtgct	attggtgtgt	tatacaacct
12001	tgagctagat	acagagtgtc	gattggtgta	tttacaatcc	cttcaagctt	ccaaaccttc
12061	ctccaagtcc	ccaccacact	caggagccca	gctggcttca	cccagtggtat	catgcaccaca
12121	ggccaacagg	ggagctgcct	gccagtccca	cgtgtgcgc	ctgctactct	cagcccttgg
12181	gtggttcgag	ggactgggca	ccgtagagca	gtgggcggcg	ctctgcggag	aggtctctgc
12241	cgcccgagg	cccatggagg	ccggtggggg	aggtccaggc	atggccggct	cagcgttcgc
12301	agccctccgc	ggcgggaagg	cagctaaggc	ccggggagaa	attaccacca	cgagctgctg
12361	gccagatgc	taagccctcc	actgcccggg	gccgcagccg	ctccgagtgc	cgccgccccc
12421	aagcccaacc	ccaccgggaa	ctggcactgg	ccctgcacca	caagcacagt	cgagcagccc
12481	ggttctctgc	cttgcctctc	cttctccacc	ctcccgcaag	cttagggagc	cggtctccgc
12541	cttggccagc	ccagaaaagg	gctcccacag	tgacgcggtg	ggctgaaggg	cttctccaagt
12601	gcgcgcaagg	tgggagccca	ggcagaggag	gtgcggagag	cgagccaggc	ctgtgagagc
12661	tgccagcagc	ctgtcacact	tcagtaggtg	gacgacaaga	aaagatgtct	cccgcctctc
12721	tttaccctgg	ttcttgctgt	cagaaggccc	cacacaggtg	aaaggagaag	cttcaacttg
12781	aaatctggtt	ttaaagatgt	attatggccc	aggagctgtg	gctccacctt	gtaatccagc
12841	cacttttgga	ggccgaagtg	ggcggatcaa	gaggtcagga	gat tgagacc	atctctggca
12901	acttggtgaa	accctgtctc	tactaaaaat	acaaaacaat	agccggggcg	gggtggcagc
12961	gcctgtagtc	ccagctactc	gggaggctga	ggcaggagaa	ttgcttgaac	ccgggacggc
13021	gaggttgtag	tgagccgaga	tagcgcactc	gcactccagc	ctgggagcag	gtgcagagct
13081	tcactctaaa	aaaaaaaat	tgattatgac	acaaaactag	atattctaac	ttctcaagttg
13141	agactgttgg	agacttagag	tgactatagg	actttttatt	acttaagagt	gtatataagc
13201	agttgttaag	ttatggagat	tttcatctct	gagcaagaga	agaaactttc	ccctattagc
13261	taactctaaa	aggcagcgg	gaatcaaaaa	caaggttgct	ttctcctttt	aaataatgct
13321	tttctcttcc	aaatctaaaa	atctgttgat	ttcatgtttt	cccttttatt	ttctctaacc
13381	actgaaatgt	gattgcttct	ggatccctca	agtttatcaa	gcataactac	aaaaccagcat
13441	ttgggacatt	aaagacactg	gacactccaa	ctaacagggg	cttgaactct	actgactgca
13501	ctcgtctagt	tttgtccagg	tgccacgggt	ccgtgggaagc	aaactcgagg	ctgttctctc
13561	agcagtttat	gaactcaaga	agtaaaatga	gaggagaaac	caggggcgac	agcgttccag
13621	ctctcttggt	ttggttcaaa	aaaaaagaaa	agaagaacaa	tgataaatgt	attacagtgt
13681	gtaacctgtt	ctgattttaca	ctcaaggtgg	cttctgctat	actctcaaac	ccagcttccag
13741	caaacagcag	tgctattaaa	accctgttgg	gatacaaat	gtttaagatg	aaaaatcgcc
13801	tggtgttggt	ggctcacacY	tgtaactcta	gcactttggg	atgctgaggg	gttcttgtag
13861	ccctgaggtga	ggcgttcaag	accagcctgg	ccaagattgt	gaaacacact	ctctactaaa
13921	aatacaaaaa	tacaaaaaat	agccaggcat	ggtagcgggc	acctgtaatc	ccactactc
13981	gggagcgctga	ggcaagaagt	tgcttgaacc	tggaagcgcg	agtttgcagt	gaagctgaat
14041	tgacacctgc	cactccagcc	tgggcgacag	agcaagactc	gttctcaaaa	aaaaaaagaa
14101	taaaaattaa	aaacacacac	aagaaaacaa	agtaaaactt	gttggtgagt	aaaccgaagt
14161	aaatattgta	aatctctgtc	caatcctgtc	caaaagtcag	cagagggagc	caacttgagt
14221	acttataccc	atctcccagc	accttttgtt	gtttgattag	aatagattcc	ctctgttaaga
14281	acttaagtat	ttccaaggct	gcttttaagaa	gtttctttgt	tatacgggaa	gtgatttgaga
14341	actggcgaatc	atgaatctgt	ctgtctctgc	tcaggagctt	aaagactgtt	ctgatgagca
14401	taattacatt	tttatgaata	tcctgcctag	agagtaacaa	tttactagt	tcaaacccga
14461	ccacataaag	atgcatcaat	ttcatctgca	atgaaaaata	gagcctataa	gtacagttaa
14521	attttataaga	tagtcaaaaa	tcaagatgta	acgtaaggtc	ttcaactaaa	agaattccga

14581 tcattatttta accttgagat gattaagggt aagcgttctc agcttccatg aattactttt
 14641 tccatgattt ttctgtgttt gtttggattt ttaaaaatcc ataattaaaca tttattaaaca
 14701 ttttgattct actccaacct ccatgatgtg tgggcaaggg aaaaacaaca acaaaaaga
 14761 tccatgata ttcttaagtg tcaaaagagag agtataggt aattalaagt cataattatg
 14821 tttcttgata aataccatac taactgtttt tctctttctt cctttttctt ctaagttttc
 14881 tccatataa atgcaaatata tggacaatgt atttaggtta gatgctatac gatcattatc
 14941 atttaataca aagaaaactg tttcatgtgt attgtgcacc agagctatgc caagtggtgtg
 15001 ctgagaacca gcaacattaa gccattacta aaaaactgtt tttctcaga attctcagg
 15061 gttaccaacag atctcttgaa tccgaatctg tagcagtggg caccagcccc cggactctgt
 15121 ttgttaaccag ccttccaggga ggtgcgatga gRtTgagaa tctgtctcc agactttgtt
 15181 aactcattct cccctggcta aagtgaaca tagttaagtg tggaggtctg aatcccgaca
 15241 acgctgtacg ttttccctgt tagctggagg agggggcatg ttttctaga aagggggccc
 15301 aagcgaacag cctgttttgg ccaactctct tgagtccagg tctctctcca ttgtttttc
 15361 tcttctcttt aaatctcctg aggtcccagt gtgcccaggg ccatagtttc ttcccatatc
 15421 cagctcatgt ttttgtttaa cctctgtgtt aggggggtgt tttatgatcc tctctatcat
 15481 gtgaggactt caccactctt gaagcaccct gttggtgctt cctctctatc actgagactt
 15541 catttctctt acatcatctt gaagctgcta aacatttttc ttttccagg acggagtctt
 15601 gctgttttgc ccaggctgga gtgcagtgaac atgatttccag ctactcgaa cctccgcttc
 15661 ctgggttcca ggaattatcc tgcctcaacc tcccagtaga ctgagattac aggtgcccgc
 15721 caccacaccc gggaattttt tatattttta gttagagaca gttttcaaca ttttgccagc
 15781 gctgtgtctt aactcctgac ctctgtatct gccaccctgt gccctccaaa gtgtgtttaa
 15841 acattttttaa catccgcctg gatactcttc tatttttctt tatggcgaaa tgaactaat
 15901 ttactctttg acagcacaat ggaccaaaat tgtttaccag aactcaccag aaagtggcat
 15961 gggagagggt caccacttgc caacacactg aagaaaacgc agtagaacac actctcgata
 16021 cagagtgtct atgctccctg gccgggacgc cacagtgtct ttaccgtagg agttttctt
 16081 ggcagagagg atagggtagc acgtagcatg agggaaaagt gtcactgagg ttgtgtgaca
 16141 gatagataga cagatataga gatatttttt attgtggtaa gaacataaca aaactcacca
 16201 tcttaaatat ttgtaagtgt atggtgaata gtgttaagta tattcacacc ttgtgaaac
 16261 agatctccaa actttttaa ctgtgtaaac tgacactcta taccittttta caaactccca
 16321 ctctccctcc acccttagcc cctggcaacc accattttac tttctgtttc ttgtgtttc
 16381 attactttag atagctcata aaaatgaaat catccagcca ggtgacgtgg ctccaccctg
 16441 taactcctag actttgggag gccgagcgag gaggattgct tgagccaggg ttgttgagac
 16501 cagcttggct acacagtgag atccccatct ctgttattaa aaaaaaaaag gaattcactca
 16561 gtatttggct tttcttgaat ggcttatttc acttagcata atgtctcaaa ggttacctta
 16621 atagaaacat ttttgaagga acgcatattc gagacaatag cattctaaat aatcagcaca
 16681 catgggacag ttgttaaatga agtgaatcag tatgacaaaa agtgaacacc atcttggtga
 16741 ttttaactctt gtattatttc atatatctt ttttgtttta atttatgacg ccttggtctg
 16801 gtttgggtgg tcatgcctgt aatccaccca ctttgagagg ccaaggcggg tggaatcatt
 16861 gaggtcaggga gttccagccc agcctgcccc acatggtgaa accctgcttc tactaaaaat
 16921 acaaaaatta gccagggtgt gtggcatgta cctgtaactc cagctaccca ggaggatgag
 16981 gcaggagaat tgcttgaacc cagcaggcgg aggttgcagt gatccccagt tgcatcactg
 17041 cactccagcc tggcgacac agagagactt tgctccaaa ataaataat aataaaaaat
 17101 aaaaatgaaa tggatgcagg ctccatcgct tatgggatgt gactcatcca cattatttca
 17161 tatatgctat atattttaa actttttttg tttatttttt tagtccaggt tccaggcttcc
 17221 tgaatacatct gtttttagagg cccagtgcaa gggcaaaatc ttttagagtg tgctctgaa
 17281 atctgagtgt gaatcagaat gaccttgaaa ttgttaaaa atcaaaatcc ctctgggttc
 17341 aagagattct aatttttgga ggtctgaggt ggagccagg aatcagcatt taacaagcag
 17401 tccaggtgat tctttccttc tgagagacac atgactctca aatcagcagg ctgagcagat
 17461 gccctttgag gtgaagcagt gaggctcaac ccttltcaaa ggtgttgtag ctctcttgga
 17521 tctctcctgat gcaattgata tggactttga ataacaaata atgactctgt cctagtctta
 17581 gagtltctca tgccttggcc tcagccccgc ccaagacca caggctctct gagacaagg
 17641 cattttcgag tattgacctc catatcctca ctgtactctt cctcagcgtg tctctgttga
 17701 gagaagatgt gRataaatat ttgtcaaatg aatgaagaca ataaaggacg aatccaagt
 17761 aaaaagatgt gactgaaaga gtacagaggg aatttagtct tgyYctgtga gccaacagc
 17821 tgtgagggct taagttaact cctctctcag gccttagccc tgtacctgtg acatggggat
 17881 cagtlttcttc cctctctctc tttctgaggg ctgctgtggg gtacaaaatga cataaagtt
 17941 tgaataactg ctgaaaactg tggagccaat cttttcaatt ttgttgaaat tgactgtctt
 18001 tttgttttca tggagtgttag ttagttagat gaggcagaag acagcaagtt ctttcccaag
 18061 tattaccgaa aagcgaatcc tattatttgg tattttaaag agccactatg ctttcccaag
 18121 tccaaggaga gtgacaaaaga aatttagtac tataaattta tgaatagatt ttgtgaaata
 18181 tcttataaat aatgaacagt acaaaaggag ggagatttga aggaagcga attaactgag
 18241 cacactgcag ttgattctg acatggggat tctccgtaac ctgtaactga ttaatagatt
 18301 gactctcggc ttctctgaga tcaactttaa aggtgacagg tatctgataa gatgagctga
 18361 aagacaaatt tatataatat acttcaaggc aggtattata accgacctt

18421 aaactgcgcaa gaacccaaaag aagttggatc acatccaaga agcaatgtgt cccaggtgttc
18481 aaacgcgagc ccagtcocaca gtccaatgag gaaagtggag acaacgggagc agagttttgca
18541 ggaagactatg tttatttcagt tgagccaact gcctctattct caaatgtagg ctctccattgt
18601 cttggctcac taaggttctct acttatagga aatatcggtat ttttttgaat ctgcacaaattg
18661 aaaaagttgac aatgatatta ctcccccattc aaattttgattc aggcacacttt gagttttgaat
18721 tctcaatcca cttaaaggcaa gtggccttgag gcaaaattctc gcaaaattctc ggccttgattg
18781 tctctatgtat taatgatata aagatttgcca ataatttttg taaaaagcct agactcaaat
18841 gtatgatattg ttgtggttat atgaaaaaga atgtgtttgc atttagatattc taattttggt
18901 cagttgcttcc ttttttaaaat tttttttatt gttttaagag atggggcttc tggcccccac
18961 gctggaggtc agtggaaagga tcatagctca ttgcaacctc aaactctctg gctcaagtgt
19021 tctctcctgcc tcagcctcctc gagttagctag gagtataagg acatgccacc atgccccgct
19081 aaYtttttaa atttatttga gacagggtct ggctatgttg tcSaggtctgg tcttaatttc
19141 cagggtcccaa acaatcctccc caacctcagcc tcccaaaagt ctgggaaatc aggttgtagc
19201 cactgtgcct gccatgggta gcttgtcttg atgtgtataa attactgttt tcatgtattc
19261 gtttagatgtt ttttcaattt cccatgggtg cctccttttg gactgtccat gctttgtctc
19321 caagatgaaa tctcaaaagga gcaagcatga gttaggaatt tcttgcagtc cacacagcca
19381 gccaaacagc cctatgtccg tgatgagggt catccagaaa ccagtggttag gatggggttg
19441 ggttgatcct actagctgaa gtttttatta gatgtagaat ttaactccac actgtgtctc
19501 gggctctagta tttaaaaact tctctattga ttatgtatat ctttgtattc ctatgtctta
19561 ataaattata gttcctcaac tactgtttgt tgatgtattg aataNtgtag aataaaat
19621 caggggatcac aacagctcca ttaaatcatg tgggtttttc caattatttg ctgctatttg
19681 tttctgggaa tgatctgaaa tagatagcat ttgatgtgt gacctttaac ttaaccaagg
19741 agcacagaaa caggaaaagg gtgggagctcc ctatgactaa acggtttatg ttaagttcat
19801 gatggatatt cctaggtgtc ttgttaggcat cttcctggcc aaatttttaag ctaagtttga
19861 gcgcacagct taataacggc ttgacttgtt ttccaggagc ctcaaaggta ttttctttag
19921 taggtctagt tctggggcct ttgactctaa tgcaatgtgg ctaacatgta gacctgtat
19981 ttttagagac atttaccaggt cactcaggga gtatgaagga ggcaaacact ttggtctct
20041 tataactgtgc actcagagga agctgggtggc tttaaagttt taagcacttt ttgctgtct
20101 agttctccac cagaagttga gcaaggcaga attgcaaggc caggttccagg ttttgtgat
20161 tctgaagcttt tagacaatat aagttgtctc atttaagaaa gataataata aatcatata
20221 aaaaaactag atatgaaaat gagtatKtaa cttgaagccc cagctagcaac gactgtctc
20281 cactctgaat ccttgccacat taggaggtcg aggtggagac cttgctcgag ccaggtgta
20341 tgagactagc ctgggcaata tggcgagacc accctctttt acaaaaaaaa aattaaaaat
20401 tagccagagca ttgttgcgca cctgtagtca gtccaggtag ctcaaggagc tagagcgagga
20461 ggattgtcttg aactcaggaa tctgaggtcg cagttagctca tgataatgcc actgcactcc
20521 agcctgggtg acagaatgag accctttaa ataaaaataa taataatag ttagaagcca
20581 acccccccct cNccgcttg caactggggg atcctacagc ttgagcttaa ttgcttctt
20641 ataaatgcac ctgtgtaata atgggaagcaa cattttaaga caaaggctact tgtgctataa
20701 cgttgatgag tgggacattt ctaaacattt accagtatga gaaacacgta actgctaaat
20761 gtaactcgac atagacatta aatgccaagt gttcaggctg cagggaagtg agactgttgt
20821 aagacaaaag agaaaggaaac ttgtgactat taggtaccga gggagccttc agtttgttg
20881 aatgttttaga aaactgggaa tcttgaattt tactctccaa attaactcaa acccaaaaga
20941 tataacttat ttgtcatcaa aaattctttc aaatactgtt tttttcaagg ttctgttagg
21001 tttaacaatt tttaaaaagc gagtgttaatt taccatgaca ttgagattag aaagaaagta
21061 aaaaataatc ttaagggggt aagaacctat aaaaatttgt tcttctccac tagatgcaag
21121 cctctatagg cttgggtgac tgaagtgtcc cccatgctgt ttgtgaattg gtgctggcct
21181 ccttacctgc cactcagaga tcaacttgacc actacagtca cgggtggggt accagttaat
21241 agctcatcttg ttgtgaagct ggtaaacagt aagtgctcaa taaaacctta gacttgtca
21301 gaatcaaatc aataattcca cttgaaacaa acgaggccag acttaagaca attttattc
21361 ctaaaagatt tgcaactgaa ttttgcgaag actctcttat ttatttatt ttattattt
21421 attatattct aagtttttag gtacattgtc acaatgtgca ggttagttac tatgtataa
21481 atgtgccatc cttgtgtgct gcacccacta actcgtcatc tagcatatag actcagact
21541 aatatggaag gcttcacgaa ttgctgtgct atccttgccg agggggccat ctaactctct
21601 cttatcgctt ccaatttttag tatatgtgct tctatgtgct gacttgtca gacttgtca
21661 gcgtttgaga attctgtcat gaatttgccc taggtttgat ggcataatga tgaagaagt
21721 aaatggagtt atttttcatt gagtgcctaa catatgccag gtactctgtc tgagttttgc
21781 atatttactt atttatttta aaatttattt tttttcaata aaccacctac aaagcttctg
21841 gatgtgtatt atttaagcct ttgaacattt ttgcaactga ggaagctaga actcagact
21901 aaaaYttg tctatggcct cacagggagc aagtgccaga gcgcaaatcc aaacgcagat
21961 ttgtgaagct accgcttttg cttgtgacgt gtaacctctc atttggctct tatgttccag
22021 ccaatgtgaa agacacataa aacagtgata gagagagggg caggaaaagac tatgagaagt
22081 ggacagtgaa gtgagaagct acatcattta gggcctttaa ttgcccactt tgaagccag
22141 acgtttggaat ttgtagacct ctgagtgggg tgaccacagc gccccattctt ccaaaagca
22201 ccagactatt acctgcttg ccaactgcaac tattagacc ccttccactc

22261 tccattttgtg atcataaaatt ctaaggtttgc cccatctgcg aagttcttggc tcttaatttca
22321 ttttatttca tactgaacct aataaactt cttctgatgc tgaagcagg taaaatttca
22381 ttttccaggc ctggaggtac agggaggatg ctgagtgagg tgacccttat tgaagttgt
22441 ctttgcattt ctgatatgga tattttttca atctaggagc tagtgcctct ttcttttaa
22501 agtacctagt tagatcccc tctagtggat ttggctccag ttaatttggg atctattat
22561 aaaaatttgg ttctacttcc acactaatg ttgctactcc ttattgagtg ctctacacta
22621 ggctcaactg tgagtgcatt atctcattta atgcatatat taatgcataa agtatgttcc
22681 tccacttata gataaggaaa caggtttagt gaagtgaatt gcaagtgaag cacaggagga
22741 ggttcttcta agctcttagc catcttctta tattgagatc tgtatgata ctacacgag
22801 ataataaaga aagttatcag actcctaaat tcccatggc ctltctctga ttatcagta
22861 tccatgccag tctttgtaat ttcactctcc attgtctcag ccatccatct ttactccta
22921 gtacaaacat ctgctccaag taacacagatt ttgactaaga atgcagatct ctgaaaaaac
22981 gaagatggga tttagcaagta ggtacaatga atatttactt acttatataa accgtttttt
23041 gttttgtctt cttttccaca gttlaaaacc gaaaacagac acttgttttt ttgtttatag
23101 ttacataaac aatactttaa agaaaaacca ccagtgcaca ccatatcatt ctgtctttct
23161 ttattgtctg gctaacttcc aaagatgcag atgtctaggg tagtctctac ctaccactt
23221 acactatctc gatgacacag atagcaaaat gtgtctgttt acatagtgca tgtTatgaaa
23281 aaaaagtttt ttctctcKa cggccttga ctataaggag gaaaaattat ttatcagtcc
23341 acaatttttt gggaacttta acaatcatcc catltctgtc actaaaaataa caaaacttgt
23401 attacacttt aaaaataaaa gacctaacag tttttacaaa tatgcaaatat acttactagt
23461 tagacataaa aaaaagtgtg tttcttttaa atccaaaagt aagggccatt tggattaaac
23521 atttctctgt gcttttacta aataaaatgc atagtgaat aataactgaa cactgagttt
23581 taatactgta atacatttca atataaaata agaggtgaaat gtKaaatc tgattatcat
23641 gttgaatcga ttatctgaa aatgttatWa aaaaacacac atgaagctc ttatctagg
23701 gaagaaaaat tcaattttgt aatttttcca agtttaagat ttttaccacag aacttatgca
23761 tagtttttaga tgcaatttag ttgcacact ttcaagaaga ggttgtagtg tattaatgaa
23821 acagctcact aaacactaca ttcWaaaaca atctattctg tggtaatggc aacttttgagc
23881 tatcacctgt ttctcagatt agaagcgtac ctgccaagtt cagatagtaa aggaagtatt
23941 ccaatttcta ctacccctta taaaattcag acccaatttc ttgtagtcag actlttctcc
24001 gtcaattttt cttaggaagg caaattccat ctttttgtaa atgggtcatt aggcctttatc
24061 atagggatgt ttttcaactg tgaattcaga taaaagaact ccaatataag gatctgtcta
24121 aattaccaaa ctgttagaga ttaaaaaaat ttttttttaa aagccaaaac atttgccaa
24181 cttgttataY cttattattt cttgattctc tttagagtaa aagcccaaat gactgtatgg
24241 aagagagatg aatggttagag gagagaggaa acacaggttc tctaattgac taaactcagg
24301 ctttggcaag gaagtatatg aatatataa tatccaaatc agtaaacctta taatttatta
24361 gacatcccat ttattagaac tctaagttct ttgtctttaa tataaatgaa acatttattc
24421 tataaataga aatgtatttt tcagaatttt ctttgggttg gtttcttgtt agcatctccc
24481 agtaaYacat gaataacata ctgaaccat gatataatg tttaggttat atacataatc
24541 atatgtgtgtc atgtgttttt aaaaaacaag taatgttaat tttaaaacaa accagtataa
24601 atatcctaagt ggaatatatt ttcccaact ctatagctag atttaaaagt cccagtataa
24661 ttttgaatac aaaaatcatat aagaaaaggc aaggtctggt cttccctatg gtcccttagt
24721 ggagctatat ttgcatagat cctagacaaa tgatgcaaaa caaattccct gatatttcca
24781 ctgacaaatc cctcaatttg ctcaaccctt acataagcat cagattttaga ttttagagtg
24841 ttggcccacc aactcaaatc ggttcccttc ttctccatg ttctgtatt tttagtMttt
24901 cctgactttt ttccctcctt accaagcctt cctagtctct ccagccctca actctgtgt
24961 cagccagaaa ggaacaaaag ctgcttccat ttcaagaagc aagaagtcag agtactgtat
25021 gagtgcgtga gccagctggt tctgagccca gaagtccga caggctttcc attgtttcc
25081 aatggcttta ttccacatga ctttagtaaa ccgtactSaa tcaatttctt acttggtac
25141 ttgaagcaaa cacttgtata cagatataa ggggaagagg aagttaaggg aggaataatg
25201 aaggtcaaac tgtgtgtcaa acaaggtgct ggtctctaatt ttatttttta ttgctctt
25261 gaatcgctca agcccatctt gccttttttg ttttttaaac aagaggtttc tgcactagct
25321 tccactctcc agactcgtgc tgtctaacc agtagccacc agccactgt ttgctctt
25381 cacttataaaa tgtgactagt ctgaatggag atgtgcgcta atgttaaaat acactctgga
25441 ttttgaagat tcagtaccaaa aaaaataat aaaaattctc atttaatttt tatgttgtt
25501 acaggttgaa atatttttga tgcataataa ctctactgt ttaaaaata tatagaatgt
25561 aaaaatttga tatggggctc acatttatatt actctaggac agctctgtcc tagagccaag
25621 ctggagctgc caaagattgt acatctgtg actcgaagt ttccagtga ccttactaac
25681 cagcttgcct aggtggtctg tggttctatg aaacagagag gaggccaag atgcgaaaag
25741 ggaacgggag aaaaacagctc tcaaggactt taataattac atgtctgaac aaataagcag
25801 tgaatgtttg aatttggttg gtggaaagct tcaactgtgc tcaactgtgc ctatcacag
25861 aaaaagctat cgacccacagc agccagcaca ggacagctgc agctgaagca agcaatagcc
25921 tggagaataa acacaatatg aaaaagctagg tgcatttctt accgatcc caccacacaa
25981 gcatattccc actccccctc ccaactttcc tcttgcccat acatgagcca caagggaaga
26041 agcagggagg aggttatgca gttcttagat agcaacaga gcaagctctg taacttggtta

```

26101 gagaagagca ggcaaaagatc acctcgggat gggaggagat ggtggagcac ccccttctct
26161 tccggttgat ccaccttggg gaaaaaacag acaaaatata attttgggta attttggtta
26221 gttctcatcg tggaaaactcg gggatggttg cacgggtacc cactacccta accatagac
26281 caggctcgctc agctaactcg cgtatgttgt cgtatgaga gtaagagctga acaaacagaa
26341 gtaatgttct gaataaacat catggtgggt gatccatcac tggctcccaa gtaacttgac
26401 aaagtataaaa aaaaatcattt tctcttlatc aagatgtgtg ctctattata atttagaaaa
26461 tatggatgag taaaaacaaa gaactcacc acctctccag caccacagaa taacaaatta
26521 ttgtgtatgt ttttacttag aaacagttcc ccgttttctt ccagaaaata gacatataag
26581 tcagtttgaa catctttcga aggcattact ctttgcaag attattaatg acagcttgcga
26641 ttccaaaata tgaactacact acagtctacc tagtcaact ccttttgttg tagtcttagc
26701 tatcttctaa ttaaaaatta gaaagctttt ctgacagtag ccattctaat ggggtgaaga
26761 ttgtatctca ctatagtttt atttgagtt tcaaaaaagt tagtgaatgt gaacaccttt
26821 tcaagtaact tctgatgtgt ttcttttaaa agtattcaac ggcccagttg ctggtgccta
26881 cccctgtaac cccagcactt tgagaggttg agggaggtg atggctgag ctaagagatt
26941 tgagaccagt ctgggcaaca tagcaaaacc ctgtctccac aaaaattagc cgggcagtgt
27001 ggtgtgcgct tgcctcatag tcccagctac ctgggaggtc tgggtggagc tagcaactga
27061 acctgagagc tcgaggtctg aatgagccaa gattgcgcca ctgacatcca ccttgggta
27121 cagatgagga cctgtctca aaaaacaaa aaaaacaaa accaagctat ctatgggcta
27181 tcaagtcact gtaactaggg ttaaaaccca ttacataaaa aaaaattcat ttactacaca
27241 aacattttgt ggaatttaa caggtgtttg cgtatgggtc atgtctgag atgttgtgaa
27301 caggtctaac tggggcatgt gtcaatcagg taggtctgct ctaaacactg ctctgagact
27361 cagtggtgct gaactggcag attcctcaag taggcattct gataggacct ctactgtgoc
27421 acctagggat ttctgagaaa gaacaaaatt tctgagcaag gaaggaggtt agggagaacac
27481 actgaaagac gccctctctc ctctaccat ccaaaccaaa attttcttg atggcagctg
27541 tgagaaaaga ctcatctgga tgaataccag acacatca cgtggccctg accataacrt
27601 gccccgccac aagtggttag tagaatgagg gctggccttg tggcctctga gcttatagag
27661 gcactccaag tgcattcgtt actgctcagg gctgtctggg tgcgctcca gggctgtggc
27721 ttggaggtcg agctgctgc agagcagagg aaaaacttgt actgacgagt cccctattta
27781 ttttttgtat atgatccatt atcattataa aatattaaac atgcccatag ctggaataat
27841 ttaaggcaaa tctacaaaaa aattttggta gactgtgaaa attaatcac caatttataa
27901 actactttta ggcagggcat ggtagctcat gcctataact cagtgcttg ggaggtttag
27961 gcagggtcct acttgagccc agaagctcaa gaccagcctg ggtgacatag gactatctgc
28021 tctctataag aaaaatttta aaaaagaaa ctgaaaaatg ccccttatgt ttcaggctct
28081 gtgcccctca aggaaggtgc aatagtgcag aggcacagat tctagtctct acattgccta
28141 ctcaagtctt aaagaggagt gggagaagat atatgcttag ctattccatt aaagatctca
28201 agggtagcag gaagatggtc tattaccaat ttaaaaatag aataaatatt tagaataga
28261 agcaaaataa aagttaggaa aaatatttgg agtctatatg acaactcctc taaagtcaat
28321 tcatttattg gtgccaaaga aggaagaagg gctgtactct tatcaaacag aagccctctc
28381 tctggtgcac acacacacac acacacacac acacacacac acaccattca aagatatctg
28441 tcccatgtga aaacttactt ttactataca cttttttttt ttttttgaga tggagttctg
28501 ctctcgtttg ccaggctcaa gtgcaatggc gacttctgct caccgcaacc tccactctct
28561 gagtctcaagc aatctctctg cctcagcctc ctgagtgcgt gggatataac cctcgccccc
28621 ctatgcccgc ctaattttgt atttttagta gagacaggtt tcttccatgt tggctaggct
28681 agtctcgaac tctcgacctc aggtgatctg cccactcag cctcccaag tctctgggatt
28741 acagcgctga gccaccgtgc ctggcctcca ctaaaaattt caatcatcaa ctcttgtata
28801 atgaatttat tatagctata ctcttcaatt ctctaaactt tatgaatttc tcttccaca
28861 gaaaacaaatc attttcaggaa ttaaaatttt ccttttaagc agtagtatct tgtttctctc
28921 tagcatttgt ccatggaaat ttctctatat ttctaaactt ttctaaactt tctacagagt
28981 cacaagacac agtttgactc aattaattta attccattta accaaataga taatcaaccc
29041 aacagaaaac cctgtgtgtg tctcgcgctg tgacacacag cacagcagta tctctagctc
29101 ctctctgcac ctgggagctg catctgtcac ttctctccca tgtcagtgat ttgtctctc
29161 accagcttga acttttagctg ttaattaatct cctaagaatg ttggaaacca caaaccaaaa
29221 atactcttaa actgtgttag gaaagaatca gtaggcttg agtacaatga aggtgtctg
29281 ttaggagtag gggccatcgc taggggtgtt gtagctaatg tgaactgttt gcttaagttt
29341 tctctatttt tggtttgga atttggtctc gaggctaaag tgcacagaa cctcagctc
29401 atggatgaca tatgcatatt tcatgctaat tctttctctg ttgtatactg ttgtatctg
29461 tttttatttt tttagatga agtctcgctc tgcgcgcaag gctggagtg aatggcgcaa
29521 tctcagctca gtcacacctc tgcacccgg gtcttagtga ttcttagtgc taagctctg
29581 gagttagctg gattacaggc acacaccacc atgcccagct aatttttga ttttttat
29641 tttagtagag atggggttcc accatgttgg ggaattacag cgtgagccac catgccagtc
29701 atccgcccac ctgagcctcc caaagtgtcg ggaattacag cgtgagccac caaacctcgc
29761 tatgtgtttt ttttaaaagt aaatttcaag cctatacat tctgttata aatctcag
29821 tagacaaatt ctaaaagagc ttcttcaatt tcttcaatt gaggaaaagc aatttagtgc
29881 ttgtctattt tctcttctt gttgacattc

```

29941 tttttggttag cattacctac attagcagaa caacagaaat aattttaaatg tccatggttaa
30001 tggtaataat ctatagtctg aaataaaaac catgtgataa catgggacat atttacttaag
30061 caatgtttatg taacccccgc caaaaaactg tacatcgta tttataactac ataaaaaaac
30121 agaaattatat gataaaaaa ttggtatgaga atctgtttaa atgaaatat ctattatggt
30181 gagatattat ggatataatt acatttttcat gtaatgctct gtaaaagctat gattacataa
30241 ctttggattat ttaaaaggag ttttttttat aaaaaattta atataatcag acattatgca
30301 aattttcaaa ctagaaggaa tagaagatgg ctctacttgt gctgtctcag gaagatgaaa
30361 acagaggaaa acgtccaaaag aagtaaaaata ataaaattta atactagcaa aaccggtgat
30421 ttttgactctg taatgacaca ttaaaaaaac tgttttctcat atgcatctctg ggcactctgca
30481 attttctccac tgctctgtgga aggggaattt actagaatgt agatggctccg aaaggggtctg
30541 ctaccccact Scaggcaaga agcctggact ttctataatg cccgagtgct actcaggcta
30601 ctcaagcgtg aatcttcaaa aaccttggca gaataactca cctcgggtttt cgtttcttgc
30661 cagtttgctg ggataaacttt tgggtcttgg tacatatggc tctggagtgct gcaaatcgga
30721 aatcggaatg aagtagaatc tgccttccca ctcatctggg aagagaacaa agcagtatct
30781 tcagtgacag acaatgtgct atgaagactt acgtaacgaa aggcacagaa tgaaagagag
30841 agaNaaccac agacatcagt gctagttttt atgctcagaa gtttaccagaa aagctgtgaaR
30901 tgctacaaaag gtcacgaatt agtacactga catatataca gRcttgcaaa tccagaccaa
30961 gtggtttttag tgagagtgtat taggatccag ccagctccct ccagtgactg tgggaactaagg
31021 tatgggttact ctttttcccc attgataaca atggcagaga taggcaactt agtatctgca
31081 gggcgtcagg cctcttacct acagtgaaact gttttagaat gtacataata aggaagctata
31141 aaaaagattct tttcagaatc ctggaatctc tggaaagtta actaaaaatga gcccccaaaa
31201 aagaacatgat cagggaaaaa tgcctccgct ttttgggaag tggggaagg gggatctact
31261 ttttaattgt aaatcatggt gggccttaga atggttagat agtttagatca gtgcaatgga
31321 gtgtgataat gtaggaacaa gaaattaaaac gcaaaacagc aaaccacata tacaacacaga
31381 tttaccattt agttgctgcc ctatagccca gggagctggg accacacctc accttcaat
31441 ggagagctctt ggaagccatt tctaatagat gttgatggt gagggtgggg tgggtgccca
31501 gcactgggctc tatcaggagg aaggggaggc ctgggtccac tctgtggact gtctactcca
31561 ctctctgctg gcaactgagg ggtagcaggc agggcccgag atgtctgcct ttttctgctc
31621 actggggagg gtggtgggag ggggctcgtga gcaaaaaaag acacttagtg cagaacctta
31681 catccactct ccataccRt gctcaccatt ggtgtacagc tggtaggagc ttgtgtgaca
31741 catgcccctt aatagggtg attttctagg atatttggct gagaaatgag taacacacaa
31801 gaaacacaaa aattgcacat gtgtacacat gtatgtgcaa acaacatgca tctagtatgc
31861 taaatgggtg ttttggcttt gaattagcac tcagattgga gatggcacag tgaatttgaa
31921 aacagggtgaa aatctgttta caccggacaac cgtatattta aaaaaacatt tttataacct
31981 ttaaagagct attgaactaa ttactgtgac atgatgaaag aattttttta aaaaagataa
32041 gatagttatg aaattatttt aggtcttccag aagaacaaa Rcttttaaat gcatagtttt
32101 gttgttaatt acagaagcat gtttctgtga tgtatatgat ctgtttccag gcagaagtgt
32161 catcaggaaa ccaaatacca gtcatcctga gagcagtaag agtttctctc tggttctctc
32221 tctttgggga ggcagataaa cacagggagt gacaaacagc taatacaact tggtttctta
32281 aaatgctaatt gtgaatcttg accctgagca agctggtacc ctgtggaaact tggtttctta
32341 gctgtaaaag agtgcagat ggtcacctgt ctacacgac tgctgccaag aaaaactagt
32401 gaaaatgcaa ataaaaata ctatgttaagt acttgaaacc attttttaa caatgtatgc
32461 agtatgttat aaccataagt ttttaagttt ctaagaaaaa ttaaggaaaa tttttttgat
32521 aatacaaaaag aaaaacctct tgccttttctc atctccaaa tgacggggct atttgatgat
32581 taagtaataa aaaaaaaa aaacaaaaaa ctgtgacatt ttcgaatga atcagaatgc
32641 gccctagtaatt ttatgcctgc tcttcagcag ttgttccgc gtatgaagt catcacattt
32701 atgtgaatac aatgtcttaa ggtgctataa ataaatatct tattagctat agatctcagaa
32761 tccaattagg aaccttaaac tgaacaacct gccaactgca gatctccctg acagaaagtc
32821 ttgctctcaa cattttacag aggtgggagg cactgcccag cccgtatgtg tctctcaagg
32881 agctctcagt gcctcacctg ggagtggtta tttattccag tatctgttg tcttctctg
32941 agtcccagct agcaagagtt gatttactga ggaagagtgt ctactttgct gtggttttaa
33001 ctctattggt gataccacca cacaaactgt actactgca ctaactaatt caatagaaat
33061 ggggcccgtgt actacgtaac tctatctcat tttctttta aagtaaatgt tcatgttcat
33121 gttctcaact ctccaaacct gtggcaccct gctccaaatc ctggcagcca caatagaaaa
33181 gaaaacagat ttctatttcc cactggcaga ataacagaaa tgcatttata ttgaataaaa
33241 ctatgtgcca gaaataaaga taacctaat acatgcttgt tctatttata tcttataacc
33301 actctgagag gtacagggat aggaagaag cctcagagag ttttgggaag tccaagagct
33361 catcagaaga ctgagtggag gagccagat atctattaga tctcagagcc ttgaaagctc
33421 cactcccact aacctgaag ccaaaacact cagaatacac agggccttct atgacactct
33481 atacgctcct tgtgggaatg taaatttgta taaatttctt ggaagggctt gtggcagatc
33541 ctattgaaat ccatagttta ctatgcacac tcaactgacc agatatccca ctatagtaa
33601 ttaatccaaa gaaatacag agatgtgtac acatattttg ctacaaaaat atactcagct
33661 attatctga acagaaaaaa tctagagatg gcccatatga ccaagtgagg gggatggta
33721 aataaactcaa ggtacatttg taggtattaa tattagtgat tttgtacag tccaggtctga

33781 gaataatcat atcagcaaac attaatgaga tactgtttaa taaaaagcaa attagcaaac
33841 aatatatgta gtgggatacc aagtttgttaa aataacgcat tttaaaaaaga ctgaagagac
33901 acattataaag aatgttatca atgatttatt ctggatagtg gtggtagaag taatattttt
33961 aatatttcttt atatttttca gtatttctat aataaacaag tatgactaac gtaatacaaa
34021 gaataataaa atgttataatg tcaatgcctg tcaatttttg gggagagttt aactctctga
34081 ctcatcatat gtgtagggcc atggcacaat ggtttcaagg ggttctctgc atctcttgtt
34141 gcacacataat atcaccaggg agctttttaa tatctcgatt cccagctgac accccagacc
34261 tgatttccag acgtgagcaa gttttaaagaa tgggtgattat gaggttctcg aggtcacagg
34321 gtcaaaagtc tcttatctct gcgtaaagga aaaaaatgcc caatttccag caataataat
34381 gtctgtacga tgaatttcaa tttttaaagt ggggtggttct actgaggttca tccataacca
34441 ctataaaacg catcaagtga gcatatttcta ctaaaaatgc ctattataat ttggagaggg
34501 caaacctcag gcaatctcca catttctcttt cactactctga aagtttggctc ctcatgacaa
34561 ggttttctcaa ctgtggtggt gggcatlga agggctcag atgttggctca gaggctctt
34621 caagccatgt gacagcaggc aaatttttag ttatgcctg agtatttttg taaagatagt
34681 ctataccttt atttgattct ccaagggatt tatgtaccag agattacaaa gagcaaaagt
34741 gactttttaa acattagttct ttaatgaata gggaaatggc ctccaaagctt ggcgaatgaa
34801 gagagagaata caggagaagt tcatagcttc ttgaagaact tcccccttct ttggaataac
34861 agagccctcc tgccggaggt ggggacttat ttcccaattt aagaaccggc aaattctctc
34921 taggggggca ggttagtgga ctggcaagta caactcagag atggaagatg aaggtctctt
34981 cctctctttt attactagtc tctgaccatt ttaactttat tagctactca gtgtctcat
35041 ctctaaaaaa ccaacagaaa taattggtccc acttttctcc aggttttaca cgggtccacg
35101 atccacagct tctgtgtcca cttaaaagca caaagcagtc tgaatttact tatgctctg
35161 ttgttagtag tatcttgact gacaggatta ttggtacatt tgggagcgtt gggtttttga
35221 agcaactcac tccactgtt gtacactctg atcggccttg cgggtccctc actggaggtg
35281 ggggtctctc actggggcgg ggaggagaag gacctgaac tctctggcaa ggttaacggg
35341 cgtgtgagca actgagggac agattccctct gtgggagttct tggggtttcg tcaattccgc
35401 tggaaacttg aggcagagga ggcggccggc gctctgtggg ggggtctggc taggtgtgtg
35461 cctgtgagga ggcgaaggc cgcggagtg aagccactgt actctgtgt ttctgagga
35521 gagggagggg aaccgttcc ctgtgtgag ctggcctgtt gcccactgga gagggtgtgt
35581 gagggggttt gctatccaag gccctgtctg ggttagcggc caggggaggg cgttggaga
35641 agggcgagga ggagctcaa gggaactgac gtattgagcc tcttccaaa cggctccgcg
35701 ggtttccagg gaaaggggga ggagtgggcc cggggtctgg ctctcgtggg ctctggga
35761 cctgtgggga ccccggtttg tgcggacttg attgaatggg tcttggagta cactgtgtg
35821 gaggaggaat gctatcaggc tttagcccca cgtcgggcct tggggggcgc attcgttcc
35881 tctgagcttc tgggggacca ctctgtggc ctggagaagg cacaggaaac ctccctgggc
35941 cacttggggg tgaagggtt tctcgagatg tggattcttc tcccggtggc aacaattggt
36001 gtccgttcc tccagaatct gaagaacagg aaaaacaa ca tcaattagga aatcaggaaac
36061 cctgaagaaa tcaagagact agagtctgtt cccagtgaat ggaagtctct tectcaggag
36121 gctataaaat acaggaaact attatttata taaattgggt ttgttgcttc ctctctggga
36181 gcagaaaaat gaccaWagct ctatttacct gcgagtecca acttctacag actatgact
36241 tccaaaaaga ttctgcataat atctcttagc attatgtata ggcgaagacc aggatgaagt
36301 gggcgagagt tctgtgtaga tgctatttca ttatgagag acaagacaaa gatggcatt
36361 gtagaatcat gattttcatt ttctctcagc accactctct tcttccagc ctgttacctc
36421 tcaatttga aactaagtca cgtgtctt ag gtgaaaaaa taattatccc aagttaact
36481 tccaaatgt agggcttatt tagtccat at gaagaaaaa gcccgaaaaa aatggaataa
36541 Mtgaagggg aaattataag aaaagagtta tgaactgaat aagaaaaaac taagaaaagg
36601 aaaaagacca tcaagtaagt ttaattgtaa gaggttgacac aggtgtgagc attcaatca
36661 caaagaagca ggaactaca caacttttt ttggtaccac gtcaacctct tcttggaact
36721 tggcaggaga gaataatccc ataactgtct ccccaagatc tcttggagact caaggttaatt
36841 accaaaagaga tggaaaaatt ctaccatttt atgagtttaa aagtgtaacca aataaatttg
36901 agcacttgtct atgcgcctgc tagtttacct gagactagag acagaggagt tcttggggg
36961 gaagaagtc tgacttctgt attatagta cttaaaagac actaaaaatg ggcagagctc
37021 caaagagtc agctgaggcc tgacaagaag gagggtgact gagggtgct cggagaagat
37141 gtgacattgt agctgaggcc agcagaggtg aggtgagcga aggtgggaaa aggaagacca
37201 gcaactttgg cagggttggc cccggggcac aagagccctg agtgagaat ggaagagatc
37261 tccaaaaacg ggcctatgt ggttagtcag ggttagtcag ggcagacaga atggggttccg
37321 gacactgtgc aggcacagga agaagcattt ggacagatg atacagtga ctatcatga
37381 attttatctc aggttctctc tctttttttt ggtctattgc gatagctgga gttctctgtt
37441 cttaaagagag aactttcttc tctttttttt ggtctattgc gatagctgga gttctctgtt
37501 gccacaggtc gagggtcagtg gctcatcac agcttcagtc acaggaaga gccacatgc
37561 agggcaactct cctcctgggt cctcctgggt

```

37621 ccactaaactt ttgttttttt tttagttagg acaggagtttt gccagtgttc ccaggctgtt
37681 cttgaattttt tgggcttcag ccatctgcctt gccctgacct gcaaaagtgc ccgaattata
37741 ggtgtgagccg accatgctctg gccctcttta ttattttatt ttctttgttc ttgttgcctta
37801 atttctctac ctgttgttaa agtactaaat ttaatacttt acacgtctgt ttaattccct
37861 ttgtgtgatt ttaaaaaat ttaaatccaa atttaaatgg ttgtctggca agtagagaacc
37921 tctcatgtga ctgagtttct ctctagattt ggaccttcca gtgtataaat agtaggcctaa
37981 ccctgaggat tcatgtatcc catattcatg taaatgttag agttttctat ttcccccagg
38041 gacatcttat aaaaaggtcta aaaaagaaaa ttattataac atgtacaaca ttccaaaagg
38101 agttttatgg taaaaattct tgagttttct tagtagctgg gagagagacc catgcccctct
38161 gcaaggtttt ttatctagge attcatgagc aagtttcagtt ttctttctac ccaggtttca
38221 tagacaatcc tgaaggactc atgtccatgg ctccctgcag agactctcga gaaccactgg
38281 cactgaaata ccaaatatct gtcatgcaaa acacttttct agatttagtg agatttglaa
38341 tcatattcca caagaYgtgc tccatctgtt ttgaaaagcg gctccacaag atttactcta
38401 ctgagacgct gggctacctc acaaaagaa gctgaatctgt caggtcacca ggcagatttc
38461 caggcccgagc aagttctatt tgctctctcc ttctctctcc actccagctga accctttaga
38521 aagatataaa aaaaaaaatg tacagggtac ccccaagac actgggtgaa aattctatg
38581 ttctgtgtag ctgtctgac ctggttaata ataataata agcttaattt agtctctta
38641 taaaacagtg ttaattttta aaacaatgta caatttttta ataaggcgga agagctctga
38701 aggtcatgac cagcctccaa actgccaac ctctgcttgt tctcagtcac tcagagagac
38761 ggaactctct ctaccatta tccctgttgg ccgtgtgact cagcttccgc attccagctg
38821 ggaactctct tcccagactt ggaggtccgc cccctccaaa acttccaccg cctccgcac
38881 cactctctcc gccaaatccg ccgctccac caaagccacc acccccgct ccagccagc
38941 ctctcttagg ttctgtagaa gaagagacac ccgacgact atgccccctg gtctggccca
39001 gtaaaacctt aaaaacaacg tacaacaggg agctggccgg ctctcgccct cagcttctag
39061 actgggattt ctctattaaa atcgaggatt ttaagagttc cctcagctca ctgagaattg
39121 cccgtcccg cagctcccaa gccacgtggt ggaagaaacg aaaaataagg atgatttctg
39181 cccacactcc caactgact ggctgccaca tgggtcagta tctgtttgtt ccgtatctca
39241 agatttgcca aatagaagga tcttcagctt ggttcacagt gctcacactg gtaactctag
39301 cactttggga ggctgaggtg ggaggtatcg ttgagccagg gaggtcaaga ctgcaggag
39361 ccaagctgtg gccactgcac tccagcctgg gtgacagtga gacctctgtc ctgataaaag
39421 gatcttcaaa gaaagagggg cgcaaggagg gaggagatc gataaaaagg tagaagaag
39481 gaaagagttt aaaaagaaag aaaaataaat atctcataat ttccaaaata cagaataatc
39541 caggctaggc acagtggctc acacctataa taccagcact ttgggaggct gagactggag
39601 gatagcttag gccccagaag tttagagacca cccctgggca caaagtgaga ctctgctctc
39661 acgaaaaata acaacaacaa caaaatgtag ccaggcatgg ttgtgcacac ctgtagtccc
39721 agctacttaa gaggctgagt gagaggatca ctgaaaccca ctgaggctgc agtgagctat
39781 gattgcacca ctgcaactca gcaaaaaaaa aaaaaaaaaa acctaagca aataccaca
39841 attgagttat actttttccc atcagtattt ttcattttat gtgttttttc ttaaaaatga
39901 gaacaaattc actaagcagt attaagccctg cttttttcat ttaacacttt gtagcactt
39961 ctgtgtctca actctttgaa aacatgagtt taaaggattc tatgttatgt tagaactatg
40021 atgtattaca taaaaattta tttaactact catttgtatg cccctttagat tgctatttat
40081 tttttaatat catgaagccc aatagtaggc tttagtaatt ttgaaactct ttgcaattat
40141 agagggtata aagatcttgt ttattttga atttatctgc aaaaaattgt gaaagatttt
40201 gatggggagc aaacaacaaa acaaaacaaa agattactga gtaattctgc tagactttct
40261 ggttactttc cattgtcttt gagccacagt atcttctcac tctgaaagcg atagaaaaact
40321 gatactaatt caatggtatt tgtccaaaga agtgcaaat agttgtgttt aagcactgct
40381 tataccctct taaaaaaaat tatctcttaa tttagtatgt tatgcatgtt tgatttatg
40441 agcttaacaa ttatttaaag tctcttccc aaaaaactat gtgaggtttt tgataaatg
40501 tatatgaat ctacaaatta atctgggaga actgatactt ttatgatatt tagactttcc
40561 atttggagat tgggtatatt ttccaattda tttagtcttt ctggattttt tgcgaagtgt
40621 ttgttgattt tatgatatac attacacatg ctttttgtta ggggtacttc aaatgtattt
40681 tttttgtctg aaattgtgaa agggatgttt tctctgttat ttctgttaat ttgtttattt
40741 tggcaccagg aaattgtatt taatattcaa taagccactt tgctatgttt tctaataaaa
40801 atttactaaa aatgtattat ctgcatcttt ctatgtatga ctagtctctc aataatgac
40861 agttttaaag ctctcttctc ctaagagttg tatgtcttat ttctgtttta tataagtaat
40921 taatttgatg ggttaaaattc caaacaatg taatattata acgtttctca ttgcaatcat
40981 gtcttgatat taatgagaat cctctgata ttccaagtt aatatgaatt attgttttga
41041 aatggttttt ttccctttct aatatctag aaatattcag tctgtggatc ctcttatttt aggtttacaa
41101 gaattttatta tagcatgaaa ttltatcaaa tgcctatca agatcactgt aggcttttgc
41161 atgtgtcttt ttatttgata tgaatgagat actttctaac attaaaaatt ggaatggcca
41221 ggtgcaacggt ctcacacctg taatcccaac actttggagg gccaaaggcg gtgagttgct
41281 tgagctcagg agttcaggag cagttcagc aataggtgga gatcccatc tatccaaaaa
41341 atagaccaaa tgtggtggtg catgctctga tgcaccagta gtggggaggc tgaagttgga
41401 ggatccctgt agcttgggag gtcaaggatg gtcagagctg ttgtctacac attactccag

```

41461 cctgggtgac aagacaagac cctgtctcca aaaaaaaaaa aggggggataa accctgtgtg
 41521 tgggtgaatt tcttgttaac atctgattga tttagatttg ttttttgta cattttagtgt
 41581 ctctttatcta tgatgataag tgggtccataa taggggtttct taattataaaa catttttggga
 41641 cagataaatt ttttttggg ttggctgtcc ttgtcgttct tttacagaat gttttacaga
 41701 tccctggcct ctaccaccta gatgtcagta gcagccctct ctgtcccccac aagtagtgac
 41761 taaaaatgct tctcagacatt gccacatac ccttggaaatg caaaaatcac cctcagttga
 41821 aaaaacctaa tgtcagactt tcttttttta tgtgtcgtct ttgtcagatt tgacatttag
 41881 gatcatgcca atctcattac aattattaga cagccctcca tctcttaata tattggggaa
 41941 tgacttatac agcatttgaa tttagctgttt cttaaaattt gaaagaaattt gctataaaaa
 42001 taacttggct ccaaaacttt ttggagagaa agtaatttaa taagtttttt attctttccc
 42061 ttgtctattg aggtttctgt aataaataa tgccttttct agaaaagtac tttctttaat
 42121 atcttaaaac attttagcag ataactttat tacactactt taattttaga aaatattgct
 42181 tgaattctct attttatctg ctttctgagt tccactttta tctattttta tttccttttt
 42241 ctggattagg tttatcataa attttgttta gtctgtatc ttttctagat ttggagctgt
 42301 ctgagatgct tatgttagct ctgctgtgga agaaaatac tgataataac tgcacagaat
 42361 tacttccact aacaggataa atcataaag actaacaatt tctagaagtgt tatgcaaaat
 42421 tgtttccata taaaatttaa aaattttgct attaactatc ccttgtcat tcaaacacta
 42481 tctcttgatg aatgacacat tttggaatc tgcactttac aggcacagat taacgtgtac
 42541 tgaactttga gagggactcc tgcactatca gacatcacc attactgttc tttttttgt
 42601 ttttttgata tggagtttca cgtctgttgc ccaggctgga tgacaatgct acgactttgg
 42661 ctactgcaa cctctgcctc ctgggttcaa gcgattctcc tgcctcagcc tctccaaatg
 42721 ctgggattac aggcattgac caccacaccc ggctaatttt gtaattttta tagagattgg
 42781 gttctccat gctcaggtg atccagcctc caggtgactg acttgctcca gctcccca
 42841 gtgtctggat tacaggtgt agccactgt cctggcccat tctgttctt taactgcaac
 42901 atctgtccat ctttcagaaa gagaagctaa agctgaggat taagctttca gattattttt
 42961 tcatgataa aactgtagga cagggtcgtg ttatcacaca taacctttta caacattttg
 43021 acatacagcc cagggaagt ttacatgcaa acagatacaa aactgtggtt aaacactgct
 43081 gcttgcaagg agcttgtgac agcagttatg gtgtccagtt gagtgtgtgg aaaggcctgt
 43141 gcactggact gtatcttctc tccatcaagg aaagcactt attaaacatc atggaagaga
 43201 gaaggactaa cactatttcc attaaataag agaagtggac agaagtgtgg attcaatttc
 43261 aaggtttcca ctatggatt cagggaatgg tctagactgt ccagctcctc tcaacagagc
 43321 ctactggctc ccttgcagt gaggagaacc agcgccctct gtctcaggtg ccactctctc
 43381 tggcctacca ccagggacca tgattcagat ggctattgga gggtctggag ggctgaggga
 43441 ttgagggaaa tatattata ccacattctgt ttttgggca ttttgaacta ctgccacag
 43501 tgtgtcaaga gttaaatacc tttagttctt ttttttttt gagacagagt ctcttctgt
 43561 tgcccagctc ggaagtgcagt ggcacaaatc cagctcaccg taactlccac ctcttggtt
 43621 caagtgtatt ttgtgctcca gcctcccgag tagctgggac tacaggcatg tgccaccaca
 43681 cctgtgtaatt tttgtattt ttagtagaga tgggggttta caatgtgtc aaggtctgag
 43741 ttgaactctt ggctcgaagt gatccaccg cctcagcctc taaaagtgtc ggaattacag
 43801 gtgcgagcca ctgcgcccg ccatagttcc ttttgaagg cagtgcattc tcaactgcag
 43861 cactttgcccc ggtaacagaa caacattcaa aggccttctc taggtctttc acttttctt
 43921 tttctcccca aaccagtagt ccacctaact ctgactcttc tttctctctc tctactact
 43981 aggtattttt cccagaaagt tccctgaagc acttctaact cttaactttg caaagatttt
 44041 gctcattatt tcaactgttg acaaaagatc atctgggtg ttgggaaggt ctctactctt
 44101 cctgttccgt ccaaatggga tctgtagtct aggaataatc ttggggacat ctggcagga
 44161 aagaagaggt ctaggaaatg gaggagacag gcttaagatc tacttaata ttgcagtag
 44221 aattctagtc atggaattat tttgtctctg ttgtaaatgt taataagtag ctttgttcca
 44281 aagaaacctc cagacttagg ttgggttgata actgaagtgt tgaactaat ttgacctatt
 44341 ctaagctctt aataattgta tcttacactt gaattacact tccagagcaa caaaaactat
 44401 tacagccatt atctcatttg aagctcatga gactcatg caactgtg aggtcaatg
 44461 atcatctcca ttttaaatg aagaaaacaa ggcttggaga ttgtacagga ttgattgtcc
 44521 aggtcttga cccacagctt ttgattccaa ggcttaggct tcttccat aggttattgt
 44581 ctctctcatc gtggtgccag gagcaatggg ttaacttcca gaaagtgttg atactgtgt
 44641 agagaattgc tctgtgtat gctctggaca atgaattatt atactggca ttctgacat
 44701 tagagggaaa cccaagccea agctcgccg ccacaggtgt gatcagctc ctattttgc
 44761 tgccttgca cgtgttgtta accaaaaat aaaaataaat agatagcctt ttgtgaggt
 44821 aggtgtgatt attaggccat aaactgttcc tctccatgtt tctttagtt tttaactta
 44881 ctgtccagta ttgtgtcaat tctgtcattg gtgacagctc tcttttagtt tctcccttt
 44941 ctgatatagc aaaggagagc atttctccca gctgtcgtc tcttatcaa ttgaggctc
 45001 tctgtattgg cctgaaggag agccatacaa acaagatgt atctcttggg ttaaaatcat
 45061 gcattgtaac actcggctgg gaaaggttgg gtacgggaag ctctgttgtta aggttctcga
 45121 ttaggtgttg taaattctcg acaagtttta gaccataat ctcttctttt aagatcagga
 45181 cgtttggaag cagatgcagc aataaaatat gtctattttt aagggaggaa gagtcaagtc
 45241 ttgattaaag tctctgaaa ttcagaccac aactcagct aactacaag ggccaggtta

45301 gggtagagatc actagacacg agaaaagaat ttttaagctg gaggagattct gcaggacatt
 45361 accagagctg attcaactaga gggtagccctg tcccttttccc attcttttaga attcttttaga
 45421 actaccaccag tgcaaggggaa aaactgtctc tagcaaaaag agtcagctgtg atgttttttta
 45481 aaccccatcaa agttctagaaa aataattccc tctgtgtata ttgccaaaag tgcctttttta
 45541 cttcttttttaa gtcagatttta ttaagggtga attttacaYat agttgaataca ccccttttaga
 45601 ttacagctctc attagtttttg acaaacatat acagttgtga aagaccacctc caaatcaaga
 45661 tatgaataat ttctattact tcaaaagttc cctcatgtcc tgtttggcatg aggtgtttct
 45721 gatgttttaat tctgtagaaa gcttagctca tggaaaattg taggtggaca aaaaatgtgc
 45781 tttaaacattc ctgattatttt tcttatattt ccagaaattc taggaaaagt cccctacctc
 45841 tatgaattg ggaattctgtt ccttcaggga gttggggaca gttggagacc caagaattgga
 45901 cttagattgta ggcacctgcc tgtgtgccg tgtctatcac acttggaaac tggctaggtt
 45961 ttgtctgtct cagggagagt ctggctgcc caaaccaca ggtcctttct aggtcgccc
 46021 cagccctctc gacagggata tgaattcaga ttlgccagt agggccacag gaggaaaag
 46081 tggggaaatg tatggtcaa taccttacc agccttttaa aaacaatttt tttttaga
 46141 cagagttcta ttagttgtcc taggtggag tgcctggct attcacaggt gtgatcata
 46201 tggaatacag cctgaactc ttgggtcaa gtagctccc tgcctcagcc agctcaggt
 46261 ttgggattac aggcacagc tactgtctct ggcttaact agccttttat tagcagagt
 46321 aggggcaag gaagaactca gaaaaaccct gaagtaggct aaccagaattt cagctggta
 46381 agttggaagc attctgaaat aactaaatga tgaagtata cttgcttatg ataaataag
 46441 ttaacattata cttctgtcca ggcactgttt tcagaccctt atgtgttata ctcttaatt
 46501 cccctttcaa cctctgtagt tattatttcc attttacaga caaggaactc gaggatag
 46561 gagtttaact catttgccc aggcacctag ttagtggag aagactggg cttaaaacc
 46621 tggcagctca gagccttccc tacaagctga tagaaggata taatgtggct cttaaatgccc
 46681 cctcccatc cagcccaac acaccgtga agcattgctt ttaaaagttt agctgtgct
 46741 cttccagaaa tgcctctcgc atacacagtt tgcctttgct aatggggattc tgcctattg
 46801 tctctgcact tgtttgtttt caacttaaca tactttggat taactggaaa accctctta
 46861 acatttaactc ctgtctctat ttaaggatg aaaaaactct gaggcctaga gaggttaagt
 46921 gatgtgtcac actggtatct ttaacagtt ttggctcaga cctctcagta cctctgttt
 46981 ctgcctcaaa atttattttg acagctgacc tccctgggt ctaactctc tcatgttcag
 47041 ggcctctaat tatgtgtttt cacaaggcca gtgttctat atggccacca acccacttt
 47101 tcccttttct catctctata ttctattat ccaaaattct gctttgaatt aggttaacaa
 47161 gtagataaag gaggttgata gataagcaag gtttccaaa cttcaagcat tctgttata
 47221 gatctatgat ttttgcatac ttctcatacc acctgtgta tttatttaat attttttatt
 47281 aagtcagttc actatagccc acacttttgg ggaacatgg ataatgaat cctcgtagt
 47341 aagccagatt ggaggttctc aaacttacc atgtgaagga ccaacttttt tttgttttt
 47401 tgtttttttg tgcagagtc ttgctctatc acccagctg gagtgcagta ttgtcaatcc
 47461 agctcactgc agccttgacc tccgtggctc aaacaactct cccactctc cctccagagt
 47521 agctgggact aagaacgc accgcatgt ctggctggct aattttttat attttttttg
 47581 tagatattgg ggtctcgcca tgttgcacc gctggtctcg aactcctggg ctcaagttat
 47641 ccttccaaag tgcacgcctg gccaggacc agtcttttga aaaaattttt catcaggaa
 47701 tgacgctttt gtaaaataac aatgaattat tagaaaaatg atttagtttt taaaaaaaga
 47761 cacacacacat ccaactctag aaacagaaaa ctactgtcaa atgtctaga attctctaa
 47821 atgtctact tcaacttttg tctcatcac ttgtgggact cttaaaaagc agtttgaag
 47881 ccaactctc agtaacata agctaattaa taggcagttc ttctcaact gtttcaact
 47941 cagatagtt atataaattg gtctcatgga aacctggggc aagaaaattt cctctcaagc
 48001 ctcaagttcc ccaatgtaaa atggtgaaa tgaaggaaac atcaagtga tgcctctctc
 48061 cagtgaagc ttcaacaagt ggagagggct ttgtacaga gcgtatctt ggccctttcc
 48121 atgtgaccaa gtggagagtt gccaaattcc tgaagagggc acactaactt ccccaagag
 48181 tcttatcaaa ggagcaggt gagccgggca cagtgcctca cgctgtaat cccagacact
 48241 tgggagggcg aggtgggtg atcaactgag gtttagagt caagacaagc gtgcccaag
 48301 tggtagaacc cgttccatc taaaaatga aaaaatagc ggcatgggt gtgctgct
 48361 ttagtcccac ctacttggga ggtcagacca ggaagtcaac ttgaacggga ttggaagtt
 48421 cggttgagct gagatcgtgc cattgcactc cagcctgggt gacagagca gactcaaaa
 48481 aaaaaaaag accagatga atccactgaa gaaattctt caggaaaatg gacttaaat
 48541 gccataatgc aagtatagat ttaaggagg atgtgaatgt gtagggcaga ggtggtgag
 48601 gaggatattt gtcaaaaaca gattgggaag aagaggggaa aagggcagaa ggtggaagt
 48661 agtgacagcc gaagacactt taatggagat cactgcagcc agagacctg gttcttaga
 48721 gctggagccc agaatlaaa ggccagacat tgagtctat tgaattgaaa cagtgcacac
 48781 tggctcaga actgactcgt caaacctat cttggccag cacatgtccc tgcgagagt
 48841 cggcagaaaa cactcatca gccaaattcc accctgtatc tactcatcac acgagacct
 48901 aaaaacaaac aacctctcgt gttgtttgta ttgtctgggt ttcaagttat gggttaccct
 48961 ggcagctgg aaagcctggt gtatcacatg tgagccagaa tgcaaaaaca tttaatacct
 49021 acacatgcac gccaggtttt ggctctatt ggcttcttt atgcatagaa agtgtttggg
 49081 gaggagacac tcaccagtgc aaacgtcggg gtcgtggag gggagggaca

49141 ggcctcttgg gcagttatgc gttcaacagt cttgctgata aatctggaag aacaagaatg
 49201 cgatcatgta ttagatgtaa tcttagtaaat actgtcctaa tctgtcttcca ctttcccacc
 49261 aaagttagacg ctccacttag ctcaactctt agaagagatg ggcttaccct tacactccac
 49321 tcttaaaaca tttctgttct ggaagatgcc cggtctgacc cggaggtggc
 49381 ggagagaaatg gaggccacat ccagtgccct actcggctcc attccccacc ccactacagt
 49441 agggcatgac cgaccaggt gggccaggt aagcagaaag gttccacaca cttcctaggga
 49501 tgtatctctg ccaagtttca ctgaaaaaaa attcaattca agtggtctct cctcttgcct
 49561 aatttccatg acaactcctt catgctctcc caccctctcc ggcttcttcc tccattctt
 49621 cctcgacatt gccWagtctg tgtgtgcact cgaggaatat gaaatgaat ctacttctg
 49681 tccggccctc aaagtctcta gtcctccagg gagagggcat ggagaatgt aggtggaaag
 49741 caggagagcag cagctgaggg ggggtggagc tgtKgggggt caaccttatg tttgagacac
 49801 tcaaaagacca gccatcccta tctctgtgct ccttagcatt tctctagagg atctaagcga
 49861 aaacagagcag ggcatgagaa gtcagaccta ggactccagc gctgtttacc agaaatgcac
 49921 ttcattttaga agagcctgtc tttagctttgt ttgggtaaaa aatlatatat aataaaata
 49981 aaaaagaaga gcccttctgc agagtgtgct tgctctgaaa acaaaaggaa cgacagattc
 50041 cgtagctggg tagyaaaagt tagggacccc aggtgggtga gggggcagg ggagagggc
 50101 agcctggcaa acaccagggc caggagagac gatggcgagg aagtcctgg tgagttaac
 50161 cagccaggag cctctcccc atttctcta atccttgcag tctgttctc tgcctcact
 50221 agaacccctg ctccctctgc cctgtctagg acaaccctc acccaactgt ctcatcccta
 50281 agcaatgcca gcttctccca cccatcctt gctacacaaa ctggtgctct ggataggcag
 50341 cgtggcgccc acccagaagc tgttagaaat gtcacactcc agtccctttt ccccacagt
 50401 gaattcgttt cagcatttta acaagatccc tgggtgattc atacgcacta aagcccttga
 50461 tagagatcga gccctaaagg agcgggcagt ctgggtcact ggccacctga ataacatat
 50521 tcttaccaga catgtgtccc aaattttaaa ctgcagaatt atatttcttt aaaaaattt
 50581 tttaaatttt tttttggaga tgaggtcttg ctctgtcaca caggctggaa tgcagtgcca
 50641 taatcatagc ttactgttgc ctcaaaattc tggccttaag caatccctcc cctcactcc
 50701 tgagttagctt agctaggact gcaggcatat gccaccacgc ctggctaatt tattttatc
 50761 tttatttttt gttgtgtagg gctctgtcat gttgccagg ctagttttga actcctggcc
 50821 tcatcgcatc ctctgcctt agcctcccat agtgcctggga ttacaggtgt gacccagtct
 50881 ctgagccttt ttaaaactcc aatagctccc taattgcaca aacaatttc tttagattta
 50941 aaattattcat ttagtccaac cactacaagt taatgtggaa aactgaacc taacaaata
 51001 ctttctatgt agataatgct aaatggcttg ctcttctgta acagaaatgg actggagaag
 51061 ctaaaaaagca cactgctgga cttgtcacag ccgccgggaa acaagaattt agacagttYg
 51121 gaagagctccc attcaaaagt ggcggtctag aaaaatgaaa ttttaactt caccagcga
 51181 Rcagcagctc tcatgtatgg agaattctgt ggatccaggc ctctatcctt cgtgtgtctc
 51241 tgactctcaa gacagcggaa gccagcatcg ctgtgctcat tttagagact cagagaattt
 51301 aaatcactcc ctaaaaacac ctgaagcaat tcatctagtc atgtcctttt ccttctgct
 51361 ctctctgctg ataacactgc ctcaactcact cactgcctt ttaatggttc gataaacact
 51421 ttcaggcagg cgaat tagtg ccacagctca cctgttaact aggcgtggaat ctgttttcag
 51481 taagagactg tctcaggcaa ggaattcttt aaagtctgtt tcttaaatg ctcttctgct
 51541 catgacatca attagtacc catagggcca catgggcat gtgacagcga ctgggtgtct
 51601 gttgtagggg gctctccatc aaggggcatc tccagcgcca ccttcagagg cYttgagct
 51661 agacgtctcc taggaccagc aggaacgaaa gggatctgat tcaggcctga cactcgcaa
 51721 agatgctgga gccaaatcaa tggtagtgc agagtgtgga aaggcttacc aaggaaggag
 51781 gatagcctgg tctgccggct gggcccaaga gatgggctgt gggagacagt caccagctg
 51841 ctgtgttgat gaaaaatccc tcaagactat ttgtctgac ttcacgttca ccgattaac
 51901 tctctgctat ctgtgatcct aatattcagg aaagggtgga tatctcgttc aactcaacag
 51961 aacctcttat gggtaggtt gtcagagttc aacagagatc aaatggaact atattgaact
 52021 cctgtctctg acagcttagg gggcagagctg tggaaatggg accctttcag gggtctccac
 52081 ctctgaaagg ctctctaatt attttacaat tctctgttgc tctgttttta gctactgtct
 52141 tgcactaact gactgtata ttaactcttg gatgacagct ccaggggagg cgtgttaact
 52201 tcatggtcca gagggctagt tggggagaaa tggcaacagt catggcttca ggcagagcca
 52261 aggcagagtt gcagaaatta gcaggcaaaa acaaggttca gggagcaaga tgctat taaa
 52321 gggctctgagg ta ttgaaaga agtgcctgct tctctctg cgcactcag atggacagt
 52381 gggagagggg ctacgggtga gggctctcac ttttttagag gtgatgcaga atcaagtct
 52441 ctttctctct tctctctgcy aactgttttg atctcagtg tttctcctgc cccactctc
 52501 acctcccccc agattaactt tccctttcca atctcaatg taacacagat gaggggagct
 52561 gccatgtcct ctctctccc ttctagctga caactctgt ggcacggctct cctactctc
 52621 aggcctgggg ctcaagggaa gtgtgtgaga aacccacagc tccaatactg ccactcact
 52681 cagccccctg atcaaaagacc aagctcgtgt gccccaacac tggggccacc gccaacacca
 52741 ggcccccttt ttggctgtct ttccaccagc ctatggactc catggggtct tgccaatacc
 52801 tggccacaatc taggggttct actaaaata atgacagta aagaactatc tatcacaca
 52861 acaagccgag tcttgcacc ttgaagggtc cccacagcca cctgtagact ctgttagct
 52921 tgggcaaaaag aatcagccct atttccagag ggcttgcag ttgttcagac

52981 tttcctggcga gectccaact tccccagaga agtagagccc caaggccctg gggaggaggg
53041 gcttccctcc cctctgggac ttgacagccc acatcadagc ccacagccga tcttactgaa
53101 ggcctctggc ctagagcacg gatcctaaca gaccagcgat tccctgcctg atctccacac
53161 cagcagcttg ttgatagaat tcaagggttc atgaacttgt atgcaaaata atgcacatatt
53221 atttctacta agcactaaact gaaatgtagc atttcccttg attatgaatg agcgccacaa
53281 accataaata ctgatatctt tcaaccata gttttcaact gatatttcaac atcatatttat
53341 aactacacac caacaatttt caacatgctg gcaacttita gatccattgc tagactctgt
53401 tgttttaaac attataaag aagtacatat tttaaaaaa aggatgctct tggattcttc
53461 tgtattttat tttatgcaat taacgtaga cacaaaaggg tccctttggg actgggagtg
53521 gtgacttatt cctataatcc caacactttg ggtggccaag gtggagagac ttgtctagcc
53581 caggagttta agactagcct gggcctacaa gtgagccctt tatctctaaa aataaaaaa
53641 aataaaaaa aaacaaatta aaattaaatt tttaaaaaa aggatgctct tggcttttac
53701 cagtgggttt atagaatgaa aaaggggaaa catgagacct tggctagcca aattgggttc
53761 tgaalctctg ctctgccacc tggcagattc agatgggaat trgtttttcc caatgtctaa
53821 atgggaaatt gctgagcaga ttaaatgaaa tgggtgtatc aaggctttca gcattgcctg
53881 ggggagcaga gctgcaagt gacagggctt agctctgtcc ctgagagggt aggatgctga
53941 cctgctggta caagctgctg agtgccctggc agaggaggga tggacctgga ggctagtctg
54001 aaggggccca ttttggctga gtggctgtgg gtggaatcgc ctgggtggga atgagctga
54061 ctgatgact ggcctcccag catttggctc ttcccttggg gatggggaga tggcaggaaa
54121 ggcagctgat tggggtgcag gagagacgca agaagggaag ggcactgca cgaatttccc
54181 agtgtgtgca gtcatctcct gcatacagaat ctgctgtgct tgtgtccggc tccccagct
54241 agttgggtcc tcaagtgtgt cggatcacat gctaccacac ttgctgggct tggcctcct
54301 acccccaccc aaccaagca atgaactttt aagaagtac accttttcaa attaatata
54361 ttttaagaat aatttcaatg ttaagttaact ttcatgata ttcatccaga tcttctaaa
54421 tctttactgt gtgtgttgac ttctacaaac acaaaagaaa ctcaagagc agaaaagggt
54481 ttgttttcca catcacgat tacgggtctga actatgtccc ctgcaaaagt gatctgtga
54541 attcctgacc ctccaggacct cagaaggcaa ctgtatttgg agtagaggct ttttaaggag
54601 tgaatgaact aaaaatgagc cattgggtga gatcttaatc caatttggct ggtgtctcca
54661 tacaagaggg aagagacatc aggcattgtgc tcacacagag gaaagtcttc aagtgaagac
54721 gcagtgagaa ggtggcaaac caaggaaaaga ggcctcagaa caccaccaac ctgcccaat
54781 ctgtgacttg gacttccagc ttccagagct gggagaaaac aaatttctgt ttattgatct
54841 acccaggctg tggattttta ttatggcagt cttagcaaat taatacaaat ggttttaaca
54901 acatacgttt gtctattatc cattgtggaa acaataagat aatgcccctt gaattaaact
54961 tccatacaat gatttctcag caagatatatt ctggaattgc atcgttaaaa aaatttaaaa
55021 atcagccaga accctagagt atgtaagtga aaatagctga agtaagggga gggatctagc
55081 atcattcaaa aataatgaaa ttttaggtga aaatagctga acagagtgca aataatttgc
55141 aataacccct tcgtaaggaa ctggctttat ggggtgagag tgctttacaca cacacacaca
55201 ataaatgact ttaaaaattt aattactgtt tcttcttgt tcttcttgt atcattctgt
55261 cacacacaca cacacaccac cccaacattt agaaaattct gacttcttag ttcattgttt
55321 gaatgaaatg gctggcatcg tttgtcttac tagaatgcta ttagtccaac atcattgttt
55381 aacacttaca tttagacaaac attcactgat ccagatcaa ctagggcatc ttgagacctc
55471 gactcacttg ttaaacatgc aatgttgcct acacagagca ctgtgagaga agcagacctg
55501 ctgagcccaac tcccaacagt acaggggaca cattctctcc aatggcatggt ccaactagc
55561 gtcacacata gctcacagtt cagtcagac gtgcccagg gtgcccagg aaactcagg
55621 aatgtgtcca cttaggaaaag cagactcatc cctgaattga aaatgatgc ctctctggg
55681 atcaagaaaag tgggtagttt atttaataaa gctgtttctt agtttcatag ccaacttaca
55741 attaatctta gattgcactg cYtagggccc acactacaga atgacatgag gtgggagtg
55801 attcctaata gctcccagtg aacacagttg acaatctccc aaggccggt ctctaattcc
55861 aagtgggcag ggtttctatt agagaagata agaagcagct ttaactcaat acatttatca
55921 ttaatttggc ctattcaaaa atataaagca ttttgccta taaagtgtgc caaaaataa
55981 ccttaataat tatcataatYt aaaatgaatg gtggaattt aaacttctt tccccaaaa
56041 gatgaaatca atagaggaat attttatttg ctgggggtgg gggagggtat cagaaaataa
56101 ataaactgat agattcaaaa atccaaactgc tctcttgccc tcaattttt ctattttat
56161 ttaactattt tttttttttt tttttttttt tttttgagc agagtctggc ttgtgtgcc
56221 aggctggagt gcaagtgtac gatcttggtc cactgcaacc tccacctctc gggctcaaac
56281 aattctcttg cctcagcctc cgaagtatgt gggattacag gctgtgtcca tccactctgg
56341 ctaatttttg tatcttggt agagatgggg ttccaaactg ttggccaggg tggcttgaa
56401 ctctgacatc cagtgatcc accgcacatc gctcccagc atgctatgat aatagcctg
56461 agcccaactg cctgaactca ttatattttt actttatata taatgctctt aactcatatt
56521 catctatgta tttcttgagt gcttttggca tcttctggc agtttttgt ttgttgtt
56581 tttcttcaaa atttcttttt tttcttttat attgtagaga atacaaaaa atcaaaagt
56641 gaaaaaaaaa agcactgaag tgtattttaa ccaactaaag agcactgaa taataattaa
56701 tttttatgt aaaaagggtt gggggtaata accagaggtt acrttttctt attttgatc
56761 atgtccttcc agcttataag tacaatgaca tctctctctc tctcctctc

56821	tcacacatac	acatatatac	acaattgttt	gacaaaaaaa	tattaacaga	acaaaaat
56881	taatacatgt	aacacaaaaa	tggttttctg	agaaaaaggt	ttaataatca	tattgagta
56941	ttacacacat	aaaaataaac	tgcaaggcca	ttcattacaa	agacagtgaa	tcactccaa
57001	gtcacctctg	aaaaataaaa	tcctcagaca	aactcacaat	gtcgtactga	cgggtactat
57061	taaaaagcat	gtcgttttgg	gattcctact	caattattct	tgattctatt	ctttagatac
57121	ctctccatga	tgcaaacctt	gctggatgta	tttaagatct	gaaaacactt	aggaatagat
57181	aagatgaatt	tggtctttgt	cttcaacttc	ctgtaaaaaa	tgcttcacaa	gaaatttgat
57241	gtctcgcaat	aaccacagtc	atcctgtttc	tttaaacaca	tctttccaga	gctcagttgt
57301	ctctgagttt	ctattttatg	acgcgagtc	ctgcaacagc	tctaccattc	ctctccccc
57361	gcattgtgtc	tggtcatttt	agaaaacttt	aatacctttg	cagaaaagtt	cggtttcttc
57421	attgctactc	ttcctctctc	caagctgaag	gtccttgctc	agagcaataa	gccatggata
57481	caagagggga	aacagaaaaa	gcagctggac	tccagaggaa	gcaaaaggca	gagaagagga
57541	aaacagcttt	attagcaaat	cagcagcttc	accagttggg	tctttatgca	ttgttagctt
57601	ccatttgtgc	tgaatgtgga	gcacacgctt	gccatacaca	gaatccctca	tcttccaaaa
57661	tgtactgtct	ttttctcagt	caatcatcat	tgaaaaacaa	tacttcagca	acgtctgatt
57721	aggttgtgtc	cttaatggta	aatgtcaatt	taagtctgct	gaacctgaa	tgtcttcttt
57781	tatatgtctt	ttagataaag	aggtgatatta	ttttggcggg	gagtagggaa	ggtgtttttc
57841	aaagaagaca	ttttgaagca	tctcKaacat	cactaagact	gggttaggaa	tgtgacacaa
57901	ttttactgca	agagtactgc	tagggaaata	aaggttgcta	tgaagttaaa	tatttttttc
57961	cttcaacttt	gtgcacattt	aatttttaaa	ttatcaaaa	tctcagacga	tcgaatcccc
58021	ttttatagat	gagaaaaatg	aggtgagctg	aatgacacgc	ctacctgtca	tattttaact
58081	gaaggaaaaa	gaaggaaaaa	atttttattt	tatccatata	attaaagagt	acagagttgt
58141	ctcccatcat	tcccatctct	ttaagggtgt	caaattctca	agctaaaaat	tctcttaact
58201	gctatcacca	cttttagttc	taccagagga	ttaagatgtg	ccactgtttc	tgctctcttc
58261	ttttctctct	tctctctctc	acacacacat	acacacacag	catatataat	agcacactgt
58321	atatatactt	tattcatttt	atcattgaaa	gtacagcttt	atgatataag	cagaagtgtc
58381	accaagttaa	cctctgaaga	agtgaaaaa	cttaaaaaag	aaaatacttt	acttgagatt
58441	gttagtttca	aagatattta	ctgtgtctgt	gacattttaa	gagctgtttc	tcttatactc
58501	gattcccaag	gcggaaaaa	caacctcaag	aatacactgt	gctgggtgtg	gtagctctat
58561	actataatcc	cagcactctg	ggaggccagg	gtgggaagat	agcttgagcc	cagaagtgtg
58621	agaccattct	gggcaaacat	agtgggaccc	ctatctctac	aaaaaaaaaa	aaaaaaaaaa
58681	aatatatact	tatatatata	tatatatata	taattaaact	ggcatgtgtg	cacacattct
58741	tagttccagc	tacttgggag	gctgaggtgg	gaggactgtg	tgagtcagag	agttttgagg
58801	tcagtgagcg	tggtatcatg	ccattgcact	ccagttggga	tgacagagca	aaacctgttc
58861	tcaaaaaaaa	aaaaaaaaaa	aacagaaaaa	aaaaagaaaa	acagaaatca	tacaattatt
58921	aatgttgctt	ccaagctgca	cttgtgaaaa	aaagctctta	caattcagat	aacttctctc
58981	acatttagtt	gtaggtgtgc	cttggtgtaa	ttaacttagt	tatgttaagt	cggttttcaa
59041	aataaatgca	cctacttagt	aggggtattc	aagagtttaa	tgaaggagtg	cttaataagt
59101	attagccatt	ttcaaaaaat	aaaataagca	aaggtgaaga	acgttaacac	aaataagtg
59161	tcagtaataa	tcacagctct	tcccccattt	taaccacag	aaagagaaac	catgagctga
59221	tttaaatcag	cctatgtgtg	tacacccatg	caaacttcca	tattacaagt	gaatggtgaa
59281	gggagatgtg	tataaagtgc	atttcaaaat	tctcagaaaa	gcatactgat	taaggcattt
59341	cttattctag	tattttttta	cagtttttaa	tttcagagca	gcagagagta	tttatggag
59401	tccagagaaa	atgctttctt	caacaacaag	cacatgttta	acaaatttga	caaaatgagt
59461	caaaccttaa	agcagaaaaa	tatcataatt	taaacagcca	gaaacttcca	aagttaaata
59521	tgtgtgttca	taaaatgtta	agaaggcttc	aaaaggtcat	aacacttaaa	gggtccaagg
59581	attcagtatc	acttcatctc	atattttagg	taggctgggg	aacttccag	ctcagggcca
59641	gatttagaat	ttgatcagat	ctgaagttgc	tgctcgatcc	caggaaacta	ttttccacc
59701	agggagttct	ctgaatatatt	cagttccacc	agagtattgt	taacctttta	aaagttagat
59761	attagagtag	ctgaagcgct	atgagcaaat	agcccatgaa	taacttttct	aaggagcaat
59821	agaaaaacct	acttagtgaa	aaatgacttt	caggttaagt	atttaagtac	cttagactga
59881	taaaagggaag	agttttgaca	tgatgatatt	ccagtaacaga	agaaacaaag	tgtgataact
59941	taacacatag	cactgtagtc	caagtgaatt	gtaagagtat	gattttccaca	cagatcaacc
60001	tcaaaaacct	ttccagtttt	ctcatcttcc	tttctcaact	tctgttccct	tttttccccc
60061	agcttttcat	ctttctctct	accaagctgt	cttacttttg	ttagtttagaa	tctttcagta
60121	gcgttttcat	ttaccacctc	tccattctct	actacatata	ctgatttagc	catataaatt
60181	tttaaaaaaa	cttgtatgcc	tgtaatccca	gcactttggg	agggccaggc	gggacataca
60241	cttgaggtga	ggagtttgag	accagactga	ccaacttgat	agaaacgggt	cttactacta
60301	ataacaaaaa	caaaaaaaac	aaaaaactgt	tacttagtga	ctaaagttat	atgtgccttc
60361	tgagtttttt	aaagctttat	tttatatttc	ttcaggggga	gaaaggaaac	gagagcaaat
60421	tgttttcttc	tacatattct	agaaaaaagt	tttttaagt	aaaaagtttc	cttagttctg
60481	ctctataagc	ctctgagtag	atggcttgaa	attttaaaaa	tcaaatattt	tcttgccaaa
60541	acatatatac	tattaaacat	aaagttataa	ctaatgctgt	agaatttgat	tctgcatagt
60601	aattgtgcac	acactgttat	aacaggaaat	gacttattct	aaagaacaaa	tctgtattata

60661 aaagactctg cttagaaatg gtttagtttg agttttgaa cttggcagc
60721 aacagaaactg caacagcttta gttecatggt attttcgttt gaagcttcca atggtcctct
60781 gtacttttaa gcacttatgt ttgctggcca caccaaagat tcaaggcgag ttgtgtggac
60841 aactgtataa tacaccaaaa ggataatat accgacataa tcccacaaat taatgtggaa
60901 aataaattcc ttgtgatcca aacttgccta gtgtgtcaaa aaattctatt gaaattcttg
60961 ctctacattt ggctcaaaagc ataagtattg aatcattcac ataccattca gtgtgaaac
61021 tagctattct ggcaacagga atagctcaca tgggtgctta cagaaaaatt aaaaactctt
61081 actttgacat actatggtcc attaaaagcc atttagttct tccctgtagc tgaataatga
61141 aataaactta gtttgaatat aatttttctt accgttaaa ggttactgag ggagccatgt
61201 tcagggacac aggcagacag agggccagcg ggacagagag caagagagag cctgtctccc
61261 gaaaaaggtt tcatcttcta acgcaagtgt ggggtcgttt ttggacagcc attttggaca
61321 agactctggcc tcttgttaaa ttgtacatac tgagtacagag gcagactctc ttctgtggtt
61381 attcgctccc ttgtctgatta atttgttgtt ttgttgtctc tctctcttgg ctgcagaaaa
61441 agaaaactga ttggttttgc ttaagaagca agcaagaaaa aaaaactcaa ttaaaaaaaa
61501 ttaaatgttt ctctccccc caaggtgtaa tacacagcta ttgtgtacag tgacaaaggg
61561 agatgagcac ctccactcag tgaagagtc aactttatc tagatatccc cacaaaaaaa
61621 actgttctatg gaacttgaga ttccctttag aaattatat ttgaaagtat cactgtaaat
61681 agctgactatt ccattgagta atagggaaaa gagtcactca agaaagaaaa gctcttacct
61741 accttacctt atcgcttcat taggctaagg gcttcttctc atttaccagg atccaagatg
61801 ttgtggggaga aagttacaaa tgcaggtaaa gagagcaggt caggtgtatg aaggcaatg
61861 aggttctttt ttgtgttttg ttttatttat ttcttttttt tttagagagac agtcttctgt
61921 tcaacttaggc ttgagtgcag ttgcgttaac atagctccct gttggccctg cctcctgtgt
61981 tcgagcaact ctccagcctc agcctcctga gtactgaga ctacagggcat atgccaactg
62041 acctgctcaa ttatttttat ttttatattt ggttagagat ggtacttgtt ttgtgccca
62101 gctgtgctct gcaactcctag ctctcaagtg atccttccat cttagctccc cagatttggg
62161 ggattacagc cttgagctac catacttggc agcaaatgag ttgtgaaacg ttgtttctgt
62221 gcccaagcta gggtataat atacagctta agtcaagctc agatccatag ctcttctatg
62281 caaatgtttt ttgtccccc accttaatggg atacagtaaa ctctctaga agtgtctgtg
62341 caaaaagcata ggagataaaga ggggtggaag aagaaagtca gatttctcat tattaagaa
62401 ctcaagagtg gatgtgcaat ggaatacatg tagaaaaacat ttatacaaaa cctgtgattt
62461 ttgtatgaac gatctgaaaa ttgtctataat tttttcttaa ccatcttaa aggttcagac
62521 ttacatagc aacacatagt atataactc gagaaaaacag taacagtcaga aatattaaa
62581 agagagggat atttcagaaa ctactgtcat tttaaaatct tttaaaatct tctgtattct
62641 gctaggtaca gaggccagag gcatgaaaaa aacgtatgtt ttctaacttt gcttaactct
62701 taaagtgtat gaactgggct agatgagtaa ttctcaactc aggtagctgt ttgggggtgt
62761 gagcagttag ttggaatggt gggggcaggg gctgtagca ttcaagtggg ttggccagga
62821 atgggaaatt tctatgtgtt ctatgacag tcccacccaa aataccagaa gtgctcctac
62881 ttggggatag ttggacagat gatgtctaag gatcttttaa actcaaaatt cctgtagata
62941 ggagtctaat tgcatagaca gatctatgat gccaggccat gggcagactt cctggagtgg
63001 agtaccceag aataagtgac tgagagtcct ctgctttgcc ttggacccct ttgagccagg
63061 gaccgcctct ttgttaactc ttggcctggtt tccaccctgt acttaggtca caaataaata
63121 cctgcagctca ttgggctgga cagaggtgga ggcctacagc ttatcagcac ttcccggat
63181 acaaaacctc aggaanaacag aaaacttgat caactattaa gtaattgctt gagtgaatct
63241 ttggggaagt ctaattatag ttgggtctaa aaagagaaca ttggcgatat ttgtttctc
63301 ctactatttt tcagaaatat ttggaagtct ctaagtaaga acaccccaaa cacacacaca
63361 cacactctct ctctctctct ctctagctat ctctctctct ctctctctct cctctaacac
63421 ataccatcta ttgctatttc catcccttag gggagtgttc cctaaccttt ttggcaccag
63481 ggactgtggt ttgtggaagt aatttttcca cggagtgggt gcaagggggt gggatggtt
63541 caggatgaaa ctgtcccaac tcagatcatc aggcattaga ttctcataag gatctcgcat
63601 gcacagtcca ctttaggatt ctgtctcctc tgagaaacta ttccgcagac gatctgatg
63661 gaggcagagc tcaggaggga acacttgctc accagctgct cacttctcgt ttgtgtgct
63721 gtttctctaa gggccataga ctggtttgga accctacctc taggaaaaagc tctacttagaa
63781 gggagtatgt cacttagaag gctgcagtcc ccaagacatg caaggagatg gttgtgtagt
63841 ttgagtctat tctacagtc aactttgga acattatata ggtgtctact atgcagttaa
63901 ggacataaat tagataatgt tcttccctgg cttaaaaacc tccaatgatc tctcatatca
63961 cttaaaaaag ccaactctt aggtccacag ggaaccagca ttgtgtgccc ctctttaa
64021 ctctgccttc atctcaagta atattctgcc ttgtcaattt accttcaaaa tcttctgtt
64081 ccttaaaagc accaagctca ttgtcatctt caggcctttt acttgcagtc ttggtactga
64141 gccttggtga actcatcttt ttgttctttt ttatttctca aatgtcagca aaaaactctc
64161 cctctcatgac ccaattctgc ttgtttcttt tatgtctacc atgtgtcacc ctgtgacact
64261 gctctatttta ctgtttattt taactgtatg ttctctcca ctagaattca agtctatga
64321 gacaggagac ttgttccatc ttgtttctgc ttgtgttcca gcatctaatg caggtgtttg
64381 actcgtctgt cttcagcatc taatgcaggt gtttgaattt tctgtttgtt gaattgaaaa
64441 gaaaattcaat gtttcttact aattctacta cagcataagt atcttttttt tttttttttt

64501	tttttttttt	ttttgagaca	gagtcgtact	ctgtcaccaca	ggctggagatg	cagtgggcatg
64561	accttgggtc	attgcaatct	tcacttccca	ggttcaacgc	attctcagatg	cttggccctcc
64621	ctagctcgga	ctacagtcgt	gcaccaccac	gcctggctaa	tttttttttt	gtratttttag
64681	ttagatgggg	gtttgcccat	gttggcccaag	ctggcttcca	acctctggcc	ctcaagtgctc
64741	tgtccacctc	agcctcccaa	agtgctggga	ttatagtggt	gaaccaccac	gctgcccagc
64801	ataatgttcc	tttaaaagct	taagactgtt	cccccgtaaa	gtgtataaata	caaatgccaa
64861	gactagactt	aagccttctt	gggagaagct	gttaaaaggga	aatttttccag	agaaaagaac
64921	agcagactaa	accttgggcc	catcagtggt	cctggcagtg	cagcgcaagt	cttatgcagt
64981	cgagtggtct	tacaccattg	ggcaattgtg	agagaaaaat	ggattaaaga	aatgaaaaac
65041	aaataagaca	actcagaagg	aaggggggga	aataaaaaaa	taagaaaaat	aagcagaaga
65101	aagctgggga	tggggagaga	tcattgtggg	ggtagaggag	agctacaacc	acactgctga
65161	cctcagagcg	tttgaagcc	acctctgcag	tggatgaccc	acaggtgctg	gatttaacag
65221	tgctgtctgg	ccttccgcag	tgaagcggag	ttctcagctc	agtgctcagct	tttccagcag
65281	ccacgttctt	taaaaaagaa	agaactttaa	ggctgcagga	gactgtcaga	gatcaaaagt
65341	tacatcacca	cttacagagg	aagaaaacagg	ggctccagaga	agtttaggcat	cctgtctact
65401	tcacacagct	ggcagcagca	gagcagtggt	caaagcctgg	gctccaactcc	actgtccagc
65461	gccattaaat	tcttttagcct	catttcagggt	tcgggtgata	ccacctaacct	cctttctcta
65521	agtacaaagg	gaggcagaag	aaagagggtg	gagagaaaag	ctgtgatgcg	gatgggagag
65581	gtgtttatac	tataaccaaa	ggcctgagat	aagtgtgatt	aaagcctggga	tgaataaaga
65641	caatcacaaat	ctgtgactta	aagagaattt	taaatggcta	tttctttccc	attttaatagt
65701	catcagtgct	agcttaaatga	cagagtaaaa	caataaccaa	taggcctcga	gaccaatcac
65761	ataaagaattc	ctccatatta	atctatagaa	ataaaaaacc	aagagcaggc	agaagattat
65821	aaaaacaata	tgttaggtcta	gccagtgtag	aaaaagtgtc	gaagaatcac	agcctcctgc
65881	cgtggccccc	agctcaacatg	gactgaatca	gtgcaacagt	gactgtgcta	aaatattggca
65941	acataagttt	taaaataatc	tggttttttca	agttgtgttt	ccatgactac	ctgtttatggt
66001	gcagttattt	ccagtagtgg	gaaaggtgtt	ttataatact	gctcccgcga	gtcttaaaac
66061	tctcattatt	ccttcttata	ctgcagaatg	actccttata	gatttttagg	gtgaaaaaga
66121	aacactacca	gattaaagat	atgcattagt	tgtaaagatc	tatttttcaa	atgtttaaata
66181	atgggaattt	tttgatttaa	aagagcagaa	acaaaggaaat	aatcctctcc	accacataat
66241	tatcagtaca	gctacatata	gggttgatca	tttaaaaaata	actctcagaaa	catagataaaa
66301	ttaaaaacaa	accttgtagt	attctgcacc	ctgttaataat	aaattgtagt	aatcttactt
66361	ggggaaaagct	ctgcagtgta	ttctgttgtg	tttggcagc	tcagacaacca	ttccccctac
66421	ttataatcac	gtccatttgt	ttgtatggag	aatcatcccg	tgctcaactc	caaaccatgt
66481	gcattccagag	gcattcaactc	coattccaga	cagaggaaaa	gcagtgtatt	caaggctggc
66541	taatccagagc	cttgcatcca	tttggcccta	gagactctct	gtgatggctt	gtgatcatca
66601	gaatcaaagga	aaYttgtagg	ctgaggcgag	ctctatccct	gagggatgag	gctggaacca
66661	gatctgttga	ggatgtaggg	gatgggcctg	ctgcaactat	cctttgacca	catgggggtc
66721	aaaaccaga	ccaaacaaat	gggaatttga	agagggagaa	aaaccaagtga	ctgtgttgtt
66781	tggttgagcc	ctgaatctat	ctataactga	agatggcctt	ttcttagacc	tttaatttat
66841	gcaaataaat	tctctatttt	atttaagctg	gtatggtcac	gttttctatc	atttagcaatg
66901	caaagactct	taagtataaa	aggaatttgt	actagaagtg	agtggttgat	gtgactaagc
66961	ctaaaatgtc	caactggctg	attttagggt	ggggaaaggct	agcgaggctg	ctggctgact
67021	ggaaaaatgt	cagtccttgt	taagtacaaa	caaaaatagct	agttaatgctg	ccacttatgt
67081	actcctcggt	ctgagacagg	agcctactta	tggtaacca	ttaatgattc	catgataaaa
67141	gcatttagaa	tgggtcagtg	tgttggtatc	ttcttgtgtc	ttttagtaag	atccacagga
67201	aagagataaa	tgtaggctga	aaactgacta	gagggcagga	gggaaaaatt	caatttttgt
67261	taagagaggc	cttttttttg	ctgtgatctg	caaccaagat	gggtgagagt	caaatatttt
67321	ggagacttgc	aggttggaaa	accocaaatc	tctcagcatc	gtcaactatg	gatagatggg
67381	ggagggaccc	gatcataatc	ctgagagaca	caattccaaa	caccagaatc	ctgaattactg
67441	aaatcccaaa	agatcaaaat	cctgaaaata	taattcttga	agaaataata	gagaatttat
67501	tgaagaatat	tattttacat	tttaaggag	gattttttta	agaacatat	aaaaacatga
67561	cagaaacatc	ctatggccat	tttacacaa	aaaaatgaca	aaataaacac	aaatattttt
67621	gcaagcataa	acactcaggt	attccaacga	cagtagcaca	gggtataga	ttataagcat
67681	acctctgtat	tcataaagaa	atagggcga	aagagaagtg	tacaaatgta	ctactacata
67741	gttgtgtatg	tttgtgccca	gctttataaa	tttgtctatc	tgaatactg	tgacaaaaga
67801	ctttttgatg	agatcaataa	aaaactgtga	catgcagtta	cccatatagg	agttgcccaa
67861	agagcttgga	tctcaagaaa	ttttcttca	aaacgcagat	ttgtataaaa	ggccatctct
67921	ctattttatg	agagtgtttc	aacattttta	tgtatatcgc	gatactctca	acacaaagct
67981	aatgctgtgc	tgaatgattt	ttatggagtt	aaatttgcaa	aaaagggcat	taatgaattg
68041	gaatttttcca	aaagtctctt	cacaattgtat	atgtccagta	ttggaaaatga	ttgaaaagtga
68101	aaatagatgt	catagtgaat	tataaaaaat	catgctgaaa	cttttaaaat	gtggaaaaaa
68161	actcaaaaat	agaaaaagaa	ctaaaaagaa	aattccaact	atgaaaaagag	tatttgtggg
68221	atagattatg	ggcaatttga	tggagatagt	ccgaagagct	ggctcaactat	gatgcagcta
68281	tctgtgtatt	gtgatttttg	ggatttttga	tgttcaggat	tttgactattt	agagatttat

68341 accttaggga ttttcatctt tgggaatttc aacattYggg attatgtgtgt tctggactgt
68401 gtccttttggg attatgatcc agatctggag taactctact ctgactccag tatggaaag
68461 tgaccaggccc tggctaatta aagccttggg ttccctggct gcagtgtact gtccagagac
68521 tactttttgaa ccaaggagat gtatgtagac ttattctaaq tttatgtggg cttaagtgtgt
68581 agtatgttat ccacattaga ggtgtggggc tggaaatggca gtattatacc cacattatag
68641 acgtggagag tgagcatgaa gccaatgcag taagagcgag ggagagctga gactcaagag
68701 gtacagcaat caaaagcaac atgtggggcc gcgcaggggc tcgcgcctgt aatccagca
68761 ctcttggagg cagaaggcag cggaatcaca tatcaggagt tgcagaccaa tctgaccaac
68821 atgtgtgaaac cctgtccctta ccaaaaatag aaaaaatagc tgggcygtgt gggglgggtg
68881 gcacctgaa tcccagctac tcaggaggct aaggcgaggag aaltctctga accccgaag
68941 cggaggttac agtgagccga gattacgccca ctgcattcca gccctgggca cagagcaaga
69001 ctctgtgtca aacaaacaaa caaacaagg gcaacgtgta gatgttactt ggatcctgag
69061 tcaaatatac taataacaaa aaatgaggca attggaaatt tggatattgt tcatatttt
69121 aatgatatta agatattgat aattgttagg tgtgataatg tgtgataatg taattgtgtt
69181 tttacaaaga atccctaact tttagagata tatactgaaa tatlttgtga tgaaataaga
69241 tgcttgggct tgtttccaaa gtaataaga aaaggaggga aagtgggtag ggttacaat
69301 gaaacaaaat tgatcatgaa atagccattc ttgaagctgg gtgaggagta cacagcagt
69361 ttttacacag tctgtctac ttttcatata tatlttaaat ttttccataa caaagaagct
69421 taataaaata agactltgtg ctcaattccct tccttatcca ctgagggctgt ttaaaggagt
69481 ttgcttaact tagtgtaaaa atgctcagac ttgtagaggt aacttcaga tctcagaag
69541 tactccttata ctctcctaaa taatttcttt tgctcttggg gaaactggat agaataggg
69601 ctcccttcca atgtgtcaag acaagtggtt tcttccaga aaaggagtaa actctcaga
69661 tctgaacacct cattattagt ggcaataaaa aagtaaaaaa aaaaagtcca ccaacaaag
69721 aacagaccct tttttctaga tcaagcactg tcaRtagaaa tctaatttga ttaactgtgt
69781 caattctata ttttctacga gctatgttag aaatagtaaa agtaaatagg tgagattgtg
69841 atatttttct ttaacacact actctcaaaa tagtatcaaa aaaaactgga taactcccc
69901 caaatagtat cattataaca tgtactaaac atttgaagaa aactatgat ttagtatttt
69961 atactctttt tttcacaaga agtcttcaga aactggtgtt tactttacta ctgcagcac
70021 tccaagtgtc ccagagccac taccacactg ggcaacacaa ctctagagac tgagggcctg
70081 acacgacgct cccactctac tcatcttita tgctggcagg atgcctgaat gactcaga
70141 agatgtttcaa tcaatgtcag tcccgaaaaa ttctgtgtcc acctagagcc aactctgcg
70201 tttatagtta taaattctta atttctgtct atctgtctgt aagccatctg ttaaaacaa
70261 gaattgacta ggtatttgtt gatttgtggc cagtagaaga gctaaattgg ctctcttcc
70321 ccgaggtctt agtgctaaca ctctagtagc cacatgtgaa gagatactgg agtaaatagg
70381 ttttaaatga agggctcaga aaaaatcacat tgccttagtc tgttttgtgc tgctgaaca
70441 gaatactgac gactgagtaa tttatgaaaa ggccagatac ggttctggaat ctgagaaat
70501 ccaaggtcga ggggccacat ctggtgaggg ccttcttggc gtgtcattac catggctgaa
70561 ggcaagagag catgcacaat gagaggcagg gaagggaagg gtgtcattac atctctttat
70621 caagaaccca ctcttgtat ctaatcatct gtccccatgat aaggacatata atctattat
70681 aagggcagag cactcaggac cttaaagggt cttaaagggt ttggggaggc tttgggaggc
70741 tgagggcagg ggaatcagag ggcaggagat cgagaccatc ctggctaaca cgggtgaacc
70801 ccgtctctat taataataca aaaaattagc tggcgctgtt ggcgggcgcc ttgataccca
70861 gctactcggg aggtcagggt agggagaatg agtgaaccca ggaggcgagg gtbgcagta
70921 ccgagatgca caccactgca ctccaacctg ggcaacagag caggactcca tctcaaaaa
70981 aataaaataa aataaagaag tcccactctc gaacatggtt gcattcagga ttaagtttat
71041 gacaaattgaa ctccaaggga cacatacaaa tacaagcatc cacgagactc aaactctct
71101 tggctttcca ttttatacca agtaaaacct aaagtctctg ccatgactag caaggtctct
71161 gaggatttga cactccccca ctccccctc cctctcttga cctcttctcc taactctctc
71221 cccactcact ttgccttagg gatlttgtgc ttgctgtccc ctctctctag tttgtctgtc
71281 ctctgtctgc tccccactc ccaactcatg tctgcagtat tctgcctga tttgtcctga
71341 caccagagga ggcagctcca cgagggcaga gtttgtctgt gtactctgtg ctgcccacac
71401 aacttagaac agtatctgcg ataagtcaag tgcctgaaaa tatttgtaag tgaattttat
71461 aagcttccag ctctaagttt agttctaac ttcacttaac ctgggggtgt gatattgtgt
71521 ctccacgttt ggctctagcc aaaaagtgct caggataaag tggaattgtg tagattctg
71581 ctccaaaaag acctggggag gctctgtctt ctcccaacag gctgacacaa cagacccatt
71641 taataagaca ataattgggg gccctgccaa cagatttaac gactgtactg cagcaggc
71701 tgtttgccag tgcaggagag agaattgagt agaaaaatg gagatgactg acttgaaaa
71761 gaggcagggg aacaaaacta ggggtgaaaa aggaagcccc aggactatct agaaaggaaa
71821 tgcaccaaac ggcttcaact actcatatcc aacaaatctg catctctatgc cctgtgtg
71881 ctgatgcagc taccctagat gctgaggaca gctgaggaca gtaacctctc ctctgtgag
71941 tttggcagtt ttgtgtctgc caaaaaccaa gaacaaaaaa acaagtgctg ctaagtgctg
72001 aggttggaaac atactctgac ttatttcttt gaagtgaaga tgtggaaaaa
72061 ccatctcatgt ttttttctt agcactatct tgtcttaggt aatttaatta
72121 aatgtcaaac atttccagat taccagatc caataatagt ggcctccagg ggaacccca

72181 tgtgaatgat agaaaagagcc ttcttgcacac ccaaggggaga aactggttggg aagccccatt
72241 ttccatctct gccaggttaca tacttgtgca cacacactga gagaagtgag ttgctgtgaag
72301 atagctctctg gttccctatg ttgtctaatc attaggttata aaggccagaa ttgctcttta
72361 caacttacttc ttggctgggtg aaagttagcca tattgttctt tattcgactg ttgcctttga
72421 taagtggcta ctgagtatca cctgctggag gacagaacta tattggaactt aaaaagccct
72481 ccttgggatt ctgaggaaca agggtaaata cctctgcacc ttctggcctg accaccacca
72541 tctgaacctg gtgggaagggt ctgagtacc taagactccc ctaggggccc tctgactga
72601 tataagccag gctggctag tgcagctgcc tgggagagcc agaccacact actctgacg
72661 tggacagtta atggtgggca tttgtgagt ccataagaat ggggggacct ctgggattc
72721 agatgtctg caatgtacca cactgtctca ctcagtaaaa aattgtccca cagacacttc
72781 aaaggtctct ttacatatgt atgtgggtga aaaaactatt tctagtattc tgaqcttga
72841 ccttaactcc aatttataYa taaactcaaa atagtattg cactgttgtt tctactccct
72901 gtattttccg gtaattgcmaa tgtcatacaa atgaataact ttgttttttt cagatattta
72961 ccaagagtta gttgcccttt tggaaaatca tgagcccaag gacaagtgtc atgtgtttac
73021 tgaagtcttt aactcaagag agcctgcaat ggcagctgtc acaccaccg tgatcttacc
73081 ccttaactcc aactctgac catgtacttt tgtttctga tgaattgtac ctgatacct
73141 accaaactgaa gttattttat aataaattac ttctattctt cttttaaatt aagactacat
73201 tggatttgga gaaaatttgt tgtgaagtca gattatttta ttgtgaagg ttcactgaa
73261 attttgaaag gggcattaga aaatactggt attacaagt ggccaggggg tggctggggc
73321 ttggagacca tgcttctggt ggctctggga tgtctacatg cactgttgtt ccttttaag
73381 tcatgaaagg ccaatcagac gattctgtct atccagcctg ggcaggtgga accaccacag
73441 ctactcacct ctgactctgt gaaggagctt cacattttgt taccaaaact atcacagag
73501 cgtgggtgat tcttctctct gtttctcagc agatcctgct ttctcagtg gcttggcca
73561 aacagaattt ttctactgc aatgacccca gatccctccc aagaactctt cctcttcaat
73621 tcaactcttc tggattcttc aaatgactga ctggggaaac agattgttgg aaaaaactt
73681 tggggttggc tggatggggt caatacctta tcaaggccaa gaaaagacca ttgtgtgtg
73741 ttctctgtgag agcatgtgca catatgtgt tcttttaact ccaataactg atcgagggt
73801 ggtgttagga tcagaaaaatg tgtgtacaga aagtgtacga ttccccacca ttgtgtgtg
73861 gttttatttt cttctgtctc cgtgtgtact cttttccca caacacggaa gctgcttaat
73921 ccaagacttt gaccatttc attctgttct agatccatc caacaaaatg atcagttgtg
73981 ggtctatgta aaaagcagct ccatgactac atttaaatat tgaactagt gggaataaca
74041 aaccacaaaat atttggggtt taaaaaacca atgtgttata tttttttgag gacacctta
74101 ggaagatata tggcaaaagt agaaaaaaa taaaaatggt ctctccctgc cttaaccacca
74161 cactcatata ataaaaacca aaaaacacaa aaaaataaaa gaaacaatga ttctgtgtg
74221 ctcaagctggt gtgactatcc tggctttgga tggcagttgt gtttggcaa ggcaagttaa
74281 gtatgtgtct gggaaactgt gctaaagttca acgtgtcaga atagcccgac ataacttcca
74341 ccttggctca cagctcacc agctcctgac cccgtctct ctctgtcacc agcacttct
74401 ccttccagat gagcttctcc aacctctagg tccctgagct cactgacctt ttccccga
74461 tctggcccca cactcaacct cccggccctc ttctccagcc aaaaagaaaa cgcaaaaaat
74521 tgtagatgct ttctagaaa tagaagtgt ttataacttt tgtgtgtctc taatgccact
74581 gtttaactgag gaggcagctgt gctagggtct catgcacagc agccattcaa caaatactca
74641 gattctctat gttccaaggt tggcttaggg gatactacaa agattaacaa gacaaaattg
74701 tccaccgtca tggagcttac actcctatct cgtgtgatga tttgttgaag gaaatttacc
74761 cttctgttta tgcgtgtcag gtgttcatct agggccagct catattatat tgaagaagc
74821 agcctcacca agatcactgt cagagcagca gtttcaatcc caaactagga tgcataatga
74881 aagggtctca aagtcctttt ggggttagtc gtttcaatcc aaggaccatt tgcataaat
74941 aaaaacaaaa acaaaaacac aaaaaaactt gatgataat tgctaggccca cccacaaaa
75001 gattattatt ttcatatgt cactaaacta aaactcagct tctgagctct atgtgttcc
75061 gactttaagg tggatcaggt agggaggaga gggagggtcg tccctctctg gggctccca
75121 cctcagctct ctgctctctgc ccccaacttc agggccactc atccataatt ttgttctct
75181 tgaagacac taaggggtct ctgtcccca tcaggaggaa atcagggtgt atcagggtgt
75241 tctctgggat aagatgatct cattgagcca ccatatgat gttgaatttt tttagatca
75301 aaagagaaaga gagggtttaa ccatgttaa ccatatgat gttgaatttt tttagatca
75361 gagaagacta ttagtggag gaagacacca catagacag catagatcat tgcacttaat
75421 actttgttaa gtttctccca ctttctcatg ttgtattct cacttaaat cacttaaat
75481 ttttttgaga cagattctgt ctctatcacc ctctatgcca atctctccac ctctgagta
75541 gctgcagctt caaacctcta ggctcaagca atctctccac ctctgagta tctgtgacta
75601 caggtctcatg ctgctctgct tggctaattt ttacaaattt ttattttttg tagagacta
75661 gttctgcatat gttgctagg ctacctcaa actcttgccc tcaagcaatc atctgctct
75721 gccctcccaa agtactggga ttaataggtg gtgccacca accccaacta tttttaaata
75781 tccactcata ataccagag aaaaaccagt atcatcttag aatttcttct cagttgttt
75841 cttctttttt gtgtttgtat ttaaaatggg atcatctttt ggaatgtgtac tgcgtcttt
75901 atatatctct ctttttcaca ttccccaata ttattctctt aaacaaattt taatagtgtg
75961 atatctcatt ttctgagatg tctattatct atgttaaattt tttttattgt tagacattta


```

76021 aattgcattcc aatttcattta ttacaaatcc tattataatt aatataacttg catctgaattg
76081 ttttgttaatt attttatagt atttccttag gataaatttt tagagtacata tcaactagaag
76141 acatgaacag ttttttttta aggaatcttg atacatacga ttaaatrat tttctaaagt
76201 tttagcttgc atactcccat cagtaactca tttctcttt taacatgtgc ttatgtacg
76261 tttcctaaatt ttgtccaatt tgatagggtt attttattgt ttctccattt ttatgtatct
76321 ttactccatt agtgggtttg tatctggatt taataaaaaa tccacgggat ttactctttt
76381 ccttattttc tctattttga acctaaaggt tacctaaaaa cctcatgatt ttctcataac
76441 aaaaataaatt atttcaacca tctgtagact gactgggtgg aaggcagtgta cggtttttgt
76501 gtgtttataa aYcaaatgtt cataaaacaa ggactacctt tatttttata gctgtggcta
76561 atttttgcga cgtatgaga atttttacc a ctgtaagaaa rgtttctatc caactgtggt
76621 aggaagaggt aggaacctcta ggcacatctt accatagctc ttctgtcctc aaaggcaaaa
76681 gcaggaaatc cttggtttat gttatgcaca tgcagaNgtg taaacttcta aagtctaaag
76741 tacagaaaaa agcagtttgt accctgagtc accttatttt agtgttcaca agaccaaaagt
76801 tcccagaaat caaggtgttaa tttaggctga cctaagtaat actcaagctt tctctatttt
76861 taccattttc attagccatt atgcataat tttagaaaaa tgagaarcta gtttagaatt
76921 tttttatgat tgcacacttg atgataaaaa cctcttttga gcacaggtca aagtcacaa
76981 ctctagcagt ctacttggtg ggctgtaatt tccagttgtc ctgggcctaga agggcaactg
77041 atctctcttc caactggctc ttcccaagtg aagacctgtg acaggatgtt ccactctgtt
77101 cacagttctt catctctgac ttaggagata ttgtatatt tcaaatatga caggcagagt
77161 ctttgagagt aagtgctgtg tacatactaa acactcaaca acattatgata ctattacgat
77221 tattaagtga gcagaaactc tccccagttc gtgctacttg gtaaaaaggg aaacaaaggt
77281 aggttggcga agtgaggcga gattgataag taagaaggca aacatgggaa cacagctgtg
77341 aaagtggctg cttttgttta cagagggata attcaatgca atgtaaagaat gaagactttt
77401 ataatgctga gttatgggtt attttttaa attttaaaca aaaaagaata aagctttac
77461 tctttgatat ttgaaaaaag taggtgctaa tctatttgat cctcatttat gtcatttatc
77521 taaaactcat ttccagatc acttagccct atttaaaaaa gctgcactga tccattcaat
77581 ttgtgctggt cactctcatt cactaaatcc tctgtatttt ttgttaattc caaatactac
77641 tagactcagt gaacacaaat tcaagaagaa aatgccctac aaatttctta aaacacaggt
77701 gtctcctaaa agttaagaaa cRgggattaa taagtgtgtt ttatgttcat taactgtttg
77761 tcatttccac ttgagagagc cattgctaat tagtagttaa gtrtaaatct caagagccga
77821 atgcagagcc acttctctcc aaatctccca ctgcagagaa caggactcct ctctattctg
77881 ctaagaaaaa gttcaaaagg ttttgggata gtctcacc aactaggaaa ttgagccta
77941 ttattttcaa gtctgcttta ttctagtgtg tgaggagtaa acaagagaaa cagttaaactg
78001 ctgggaagtgt ttccagaggt gacacataac aaacagagag aaactaggcc ttgagccta
78061 atctgattta actacgttaag tgagaaaaaa aaacatgcca caatttctat ccaagagtca
78121 aagtctctgc accacaagct gatggcattc tgacgtgaaa ggtactagtgt ccaagatgca
78181 aataaagctt tggcaaaatt gaacaccaca cagaaaaagc agtatccaac tctcattgtc
78241 agggcatcca tggaaaacaa gtatgaagat caatatgaaa tcttattttc aaagtaacca
78301 aggcctctgt atacagaatt tctactatc caagctatc tcttaacctg ctgcaaaaac
78361 ccttggtagc gtacattcta ctctcacta gcattgttca ctgcaatgct ttccaacctc
78421 tgatttgcacc aatgttgaga ttaagtttct tcttatgttc cctctgcccc aatatcttga
78481 gaattatagat gagagtttct cagaagttct aagatgcaca aagatgagaa tatctccaaa
78541 atatttaccag cataagtaac atggagaagt tcaagcaatg gagaacaata cgcacatata
78601 ttcattctac tctgatttct gtgacatgta tataactcagt ttgctaaagg cactgtttaa
78661 aaagttttaa agttatgact ttattctaaa atgccccaaa accataataa agacagtgta
78721 caatataatta cttagggaa gaaactgatac ctgttatgct ttgtctagaa ttgtgctta
78781 aaaaaaaaata aagttgataa aaggatgggt caattcagtg gtgatttgcc tcaagatata
78841 ctctctccca tctctataca aaataagcaa ttactataa aaaaactgta aagctttta
78901 tgggaatcaca tcagttttta atgtatgaat cagagaacat aacaatcact ataatgtgat
78961 catgtgttat tattttaagt ctctagctct attttctta ggtagagcat aagcttctt
79021 aaaggtctag aatttactct taaaatacta taaaatatta ctatttttat gacaaaagca
79081 attttatgaa ttatggaaaa ggaatatatt ataaaatatt ttagtaaaag cactgtttat
79141 gtttgtatag caacatttaa aagttattca aggtcatcca ttgtctaaaa taatttaagc
79201 aaaaataaaa ggaagttaaa aacagcttca cttaaaactg cagtttctca tcttctacg
79261 gccaacagag cctggaaagta tcaaaagata agtggaatc catattcaaa agagttctgt
79321 ggaattctta taaagagaag agcaggcaaa ggtcatcgga ggcattatt ttagtctgta
79381 tcttgagtat cattcaaaac gggagccaaa gtcttggtat taacaaagtgt ctgttttcta
79441 ctgctgagct cagatgacag cccaacctct atttgccaaa atagtgtgat tagcttctat
79501 tcatcactct catccaaaaa catgaaagtgc actaataaag ctttactgac atccctcagt
79561 catgaacttg tctggctagg ctggtggcca caggaaatat cctccctctt gaaactgtt
79621 caaagttaag acttggaaga agtgggtgtc tgataaccatg aaaaaaaatt cctctcaaca
79681 aaaaatagat tcaaaaagca tctgataat gctcagagag acaacaacagc caactctatt
79741 tcaactcaaa agaaaaccaa gagaccagtt taacctggcc atggtttacac acatgcaggc
79801 aaacttaaaa ttggcattta tccaggagatt ttgatccgtg ccaaaagggg

```

79861 tccatctctga ggccaagatg gaataaagaa aatacactga aagagaatca tgtgtctata
 79921 aagagatcttc acaccttctct ctccacgaga caggggaggc tgcagacctg tctggaatggc
 79981 aagctgtggcg tcccttctctg aagccactac tagatcagaa gtccactctg agctccctac
 80041 acatggtttt tccctctgctg aggcctttcc agtcttccct ccacagctgtg tctcttaagg
 80101 agctaaggag ggaagagatg acctaaagca ctgtgtttgt aagcttggcg tgaataacat
 80161 ctgagatctt taagatgacc aacattgaa ttctccattt tgacgcttta tgacgcttta
 80221 tcaaatatg ggaataacata agcaataaag accatgtttt actgggtttt gaaatatttt
 80281 tagagttttc tgtaaaagca gtactttttc tgagagaaca ggtgcgaact gctacacaaa
 80341 ttccaagaa atcctttattt ttattttcaa ataactttta ttfgacaaga actttgtctg
 80411 taagtgtctt taatttcttt tcaactctgg ctgtgtatg ctatttttag acgttttctg
 80461 ctaactggat taaggagacc caaagagccc tctgtttttg gtcatcaagg aaattttgtct
 80521 cacaactgat gattttatttg attttttttt catttttttt aataggaaga caggaaacag
 80581 tgataaacct ttaatactctg aaactgtgtg cattgacctt caactacata gtgaggtttt
 80641 cagtttcagaa cttttagggg ccattgttaca tgtggggata attaaaatgt ttaagtgat
 80701 gctttctatt ctccaagtgt tggccataat attcaagctt ggtacaagca cagagagatt
 80761 ttgtctgagc tcagtccaag ctctgcagtt tctgtctgtt tctttcttag gtggcaccag
 80821 tcagtcacat tctgcagctc atgaaaacca gcataacctt ttgggctgct ctgcgaacac
 80881 acatttagca ataagggtta gaactctttg tgttcaatgt ttcagctgct actctgtggc
 80941 caggagaaat cccaatcat aggcattctgg aagagagaga cagccccaaga aagaatayga
 81001 tgttacaaga cctgtgagca cagacccttc gtacatgttc atctaccgtg tgtgtctgtt
 81061 atactgagct ataggcatcg gagcaaatgg taatttctat cagtcatgac tcaagtgtctg
 81121 gtgtgtctct caagttagcaa tggattgact tccagggagt gaagtcatg ttttctgtct
 81181 acctgttgga ccagggaggt ggtgaaaagt tgagtccatg gcagcatcag agcaagaagg
 81241 aagtgcggtt ggttggaaag cgcacctgtg ggtggtgatg tttctccata tctattccca
 81301 aaggtctcac ccagccatag taaattatta ggaggccctc agcatctctc tgtgtagttt
 81361 aaaaatcgta ttgtattttc ttggccagtc catgaatgga aagaagtgtta tgagatattc
 81421 agaaagttag caaactgcga tgtgacctga tgcagaggtg gaaaggggtg ggtctggaaa
 81481 ggcagaggtt caataaaggg ctgttagggtt tccctttcatt tccacagtgt tgactcacac
 81541 aatttctgtt gtggatttta acggttaacta ataaggtctt gaaaaggaat cgaatttggta
 81601 tgcattagtg gaaatgacaa aggtcatctt gccacttcaag cagggtctat ttaacctttt
 81661 ttttatactt ttcaagtcct ctttccagaa taattgaaaa tcccataattt aaaaagacctt
 81721 cctttgtggc cacattccccc tcttgagact aactagagct gggtctacccc caacctgatt
 81781 caactggacc aggcagacca ggctcaggc tggagagcag gctgtgagct ggctctgtct
 81841 gaaaagctcg gcacagacaa ggaaagagga atgcacgagg caactcatgt cctctctgtg
 81901 ctcaagaagta tgaactgagg atcaaggagg ggcaggcagt tagcactagg ggggagatct
 81961 caggcaaaaa tggacagctg agccagtcac tcagtgagct taagagagaga ggggagatct
 82021 gccatctctt ggRactgagg gtgcactgtg gcttttcagg taactgaacc acatcttagt
 82081 cccaataatt ctaataatat taactactaac agtaataaca acagtaacaa tgagcatgta
 82141 ctgagctctg attatgtgct aaggagtgtt ctagggtgct ttataagtat tatcaactca
 82201 ttcaattctc acaaccctgt aagatacatc tgggtgtctg tgatgctgat gaacagacaa
 82261 gtttaagtta ttgaccaagg ccacagagct tataagtggtc agagacataa ttttaagcta
 82321 agtggtgtctg ctctatgctt ctgctcagtc tgtgctctcc tgtggggctg tcttcagtc
 82381 tctgtctctt tttattgccc atcttttcaa taaagccctt cctattaaag agggccctaca
 82441 gagggtctct tactcttcta ttgtctcaca attagcattt tctgtggctc accctatata
 82501 gaactctatt aactgacaca tacacacaca cacacgaca cagagttttt gagaaggggt
 82561 ctactgtgga cacacaggtc ggcagacagt ggcagacagt gaggtagctg gaccacagag
 82621 actcaagtag tctctctacc tcagcctctt gaggtagctg ggtgtcagct atgttgcca
 82681 atgcccagct gtttcttttt tttagatacg tctgtcagct aagatcgaat atgttttag
 82741 aaactcttgg gctcaagcaa tcttcccacc tcagctcca aagatcgaat atgttttag
 82801 atccagtttt ttgtatcctt tcatgccact aaatattct ttgaagcatg tgaatttga
 82861 actgcatatt attcatattt taacatttta cttaatcact tatttattta acacttaaca
 82921 ttaagtgtac attctgagtc aggaggagca cgttgagtc ctgtaccat ttgcacgcca
 82981 cctgtgtgtc acagttagac ctttcttcaa aatatgcat ctactgtatct ctactttg
 83041 ttttataatt gtctaattgt caatatctt atacacaaat cctgtgtcac atgttaggtt
 83101 atgctataga ataaattata gaaacagaag tatttgatca aagagtttga acattttaag
 83161 tctactgtat acacagtga gatggccttc ggggaaggcc tgcagacctt ttggtcatat
 83221 aaaaagctcca gggctgtggc atgtgtggct acacctgtaa tccagcact ttgggagccc
 83281 aaggtggag gactacttga gctcaggagt ttgagaccag cctgacagat tgcgaagaag
 83341 ctgtctctac aataaattaa aaaattagcc aggtgtagt gtgtctgct gtatgccag
 83401 ttaacttgga agctgagga ggagggaccac ttgagccag gcagctgagc gctcaagaaa
 83461 ccatgactgc gccactgcac tccagcctg gccacagggc aagactctgt ctcaagaaa
 83521 aaaaaaaaaa agcaattctc attcaccata ccttgcacaa caatgaatg ctagagttta
 83581 gaaaaccttt atcttaattt gatttcttga atgggtcaga ataatgcata catttaact
 83641 ctatgctctt taataaaatg tcaaaaggcc atttgcgtgt taataaagg ctaaaagccta

83701 taacctacag tctccaatgt tgagaccact gacgccttaa aatgctttag aatttcagaa
 83761 atggaaatac gagatcactg agtaaacagc ttcaagtgaat atctaaggta accaaaaact
 83821 agagaaggtta aatgacctgg gtaataatct tgacttgcaa ctgaataacta ggtgtcttgc
 83881 cctgtgattc attcttttag aacagattcc ttcaataacc taatggaagc aacaagccat
 83941 tgtttaccggg gtgaagaatgt aaggaaaaaa actgcacaaag aatataattgt aaaaaagaa
 84001 taacatgtgtt ctaaaactcta tttttatctc atagtaccaa ttgagaaaaa gttattttat
 84061 agacaaaaagt aaaaattcac acctagttaac tactttattt tcaagatctc tgtctaaatc
 84121 tacaaaaaat ttttttccca ggacatttaa aatatccagc acataccatc taacctctca
 84181 tccagcccaac atttactagg tctatactat ggccagaccg tgtgtcaggt gctgtagtaa
 84241 aaggggggcag agttaccaag taagaaaaaga gggattcatt ttggggacat gtagacaaat
 84301 catcacagtg agtgtgactg ggcagtaacg ggtgacat gatgccgtgg ggtgcccga
 84361 gcaatgaaca tgggaaggctt cacagaggca cgtgagctgt gctgtgctt gaaagcagg
 84421 gaagaagtgg attaagataa aataagaaga ataaggagt ggaggggcagg gccactgga
 84481 gaaggctgct gtcacatgtg gctaaacaca gcagcctggg aaaattagt tctgtgggg
 84541 atgaggcctgg aaagggtggtc tgggatcagg cagtgttcaag gagtgtggac ttcgcttga
 84601 gcaatgaaca tcatgttaa gctgttaagc agcgatgcca tggltcaagt ggcgcattac
 84661 caagctctatt ctaattggcg tacgggggag gactggagac tctgaaggca ggcgtttat
 84721 cgtgtgttgc acagacaacc aggtgtgcagg cttaaatfag agagaggcca aataaatatg
 84781 aaaggaggaga tgaattttgag taatatatat tagaagaaaa taataagaca tagagactaa
 84841 ttgatgtgtg ggtgtctatt aatgagacag gcaatgaagg aggaaggcca ggttttggat
 84901 gaaggaggatt tgcacacatt gagcttgaga tcaagtggag tatcagaaga tgaattgaat
 84961 atccagaanaa cgaatgaaaa tacaactctg gagatcagga gaggtaataa ctagctcata
 85021 gatctgaata attagtatac agctacaact ctctaccaaa tctccccctc acctccacc
 85081 ccatgcccca ccaacttgga tacttctct tgtctgtata tagttagaac agactctcaa
 85141 actaaaaata caatgcaagc cccatgcata ttttgcaatt tcttaatagc cacattaaaa
 85201 aagtgatgtg gaaaaacagt gacattaaat attttccact catgaccagc acctaatgta
 85261 tttacaatat catttcaaca ttaataaaaa aattactaac gagatatttt atattgtctc
 85321 tctacataaa gactttaaaa tccaattgta attttccact catgaccagc acctctcaa
 85381 tttggactagg ccacatttca aatggccctc gctttggact gtgcaggact acacagtagc
 85441 ctaccagggt gataggcac caacatgaac ttttttaacc ctgaaattt tgggaattaa
 85501 attaaatgga atttaatttt actgatgaga gaacaaatgag gaagcccgct gggccctcca
 85561 aatcaactgcc caccaccacc tccctctcca gagggagtcg aaaggggcag tgttacaatg
 85621 tgttggaaagt ttaggagaca tgaagcatag aaaaatttt cctctaaaat tttgctttt
 85681 ggtttataaa taccctgaca gcaactgagc tgaattttag gccatgaatt ttttactctc
 85741 taatgtggat atatatctg tctcctgata aatttctcaa ggcctgttgt cctaactctc
 85801 aaatatttgc aaactaactt cataattttg tcatgcctgc ataccacaa aactatata
 85861 tttgttttaat atttttattt aactcaacta acctaaaaaa atctaaagac atattttagt
 85921 tcatcctaaa taactatac catgaaatca tgaatttcat atgttttgtt accttttttc
 85981 tactacacat taaaacaat acatatttaa ataaagaacg tttatccatg tctcctaaaa
 86041 tcacctcaca aaccacctgt ggtatgatta tcaaaccttg aaaaactctg tcttggggta
 86101 gggaaagaaa cgtaacatac taggatcccc tctctatgcc gccagtgtct cgtgggtgc
 86161 gccattccta cctaacgaa tcccaactct cctatgagca gctgatggtc catgtctacc
 86221 cactggttgt cttcagggtc tgcatttatt ctggtgtatt agcacttgt tctgccccgc
 86281 ggtcagaaga tttataggg aacctgtatt aactataaag aaattcttaa caatttttct
 86341 ttttgttttt aatttttgtg ggtacacagt ctttgtacct atttccaga ggtcacagag
 86401 tgcctaagt tgggatttga gcttttacct ataaacatca caaggccaga gccactacaa
 86461 caccatcact aatgccctcc taagaggtgt tctatttgtt gttgttaaca aaatgtattt
 86521 caattatgaa ttatcttaa gcccaaggac ttaagaanaa aagagtgtt aaatttcaat
 86581 gatggggatg cgtagtacca aaatggttta aaaaacaatg gttatataat aacataagt
 86641 ctctcttagt tatataataa caagatctag tggctagtct atcaattact aaatttcaa
 86701 atggttaaac atataacaa tatataaaga tatctgaaat tatgttgtt attagttagt
 86761 ctttgttgt gtaataaatt agcccaagac taagttagt aaaccaataa acctttactt
 86821 tactacagatt tctgtgggtc agagatttgg gcacagctgt gctgggtgacc tctggctcaa
 86881 agtctatcac aagactgcac tcaaggtgtc agtgcgggtc gttctccat cttgaagtgt
 86941 gggggagaaa ctgcttccaa gtccactcac atgttgttgg tgcactgca tctctctaa
 87001 gctgttgtt acaggtctcc ctgacttctc gcaagagat gtagagaagg cttctaga
 87061 taacacggta gctggtctcc ctgagagtga agtctatgaa ctgagatgga aaaaatgat
 87121 gaagccacgc tcttttata cccaatgtc gctgaaattt tgcaatttct atgatgaa
 87181 tcttttttgc ctaacctcta gcaactgac gcaactgac atagagctca tagatattt
 87241 aaactcagat agcattaaca gcttgtgac tgggtccccag tgatctccac tctgtgaaat
 87301 atttctttt gtggcaggca gcttataaga tttgtccccag tatgttcaat tttactttt
 87361 tctgctgtgt gataaagtc ctctcctgta atatgcactg gatttcttaa gatcgtctt
 87421 gtgaactgaaa tgtgttaaat attaacacag aaaaaacccc tgggttaag gatcgtctc
 87481 atttgcacc acttgaaaaa tctgactgtt tctgttggg tgggacagc gtttctcac

87541 ataccacctgg aatccaccat ctgtgggcat ttacttgttt tgtgaaagat tcttaaaaaa
 87601 agaaaaaataa aacatgtgggt actgctagtg actgataaac ttggaataact
 87661 tcccttcacag ctgcaaaagg caagtgtttg gcactataaa atcagaattaa gtggagctca
 87721 actaataaata aacctttcat ctccctggg caagtgtgtca ccaactgaac tatgggagca
 87781 aacaagccat ggttagatgt aataaccaca ttctaatga caggtaggac tagagacaga
 87841 agtgaagtga ggagaagtct tccgcacaaa ttcaaatctt cttaaaactgt ggagccctct
 87901 aaaaacttaa tcaaaagtgt gtctctaggg gctgggctga cctctgctta ttactcttcc
 87961 agtcataacg actgcaggta tttttcttct cgtactgaa aaacagccctg ggtgctctac
 88021 gacagccccc tatcagagaa ccagtgaact agggacacaa ttatagtttt caattttccc
 88081 ctcttagacg ccaatccaaa ttgtcatca cctgttcaga gaaatgcctt actgttttcc
 88141 tctcaactgg gtgaaattg ggtgatattc aaaaatttta acaaccaatg aggcacaggc
 88201 actaaccaat taggacaaca taagatgctg gagcagggtc caggggcacc ctgtgctgtg
 88261 ctggcattca tcttttagtt gttgaattat gggagaagtc tttaggggtc tgggggtgtg
 88321 ctacaggggc tgagggtgat gacaattcgc caactgtttt tttagcatct cattatttta
 88381 ataccocagg tatctgcacc agtgacacaa agattgaata ttcaactgtg aggggggtgt
 88441 gggctgctgc tcccaagggc ccccatggaa ggctactggt gtggaagctg acccacttgc
 88501 ctacagcgtg tctgacaact ggcactatgg ggacagagcc ctgttccatt ttcttgagcc
 88561 tgagctcagg ccagagccctt aaggtctctg accacttcca accaggcact tcttggagct
 88621 tcaggtctcc ttggggcgccg tggctggcag tctccagtt accaggcact tcttggagct
 88681 agcccaaggac agctcgtgcc ggtctggcatc aatgggcttc ttgtgcaactg aggtgttagt
 88741 ggaagtgtct ttgtgggttt gatggagggc atgtttctac tccacaggtg tcataccacc
 88801 cagatgtacct caccactgta caggatacag gctaaagaaa agacttggtc agatttccc
 88861 ctcaacttga ggaattgttt agcaacttcc tcagctttct cctgaagttc tcaggtttat
 88921 ggcttatcac aaaggagatc attctgcatg accctttggt ctgcatattt tcaactgaat
 88981 gcccggtttt gttttacttt actccatgct tctggaaagc aggtcggggg gctctggatg
 89041 cacatagacc tgggtctgaa ttccagctct gtggaatgca tccaccactg acttccactc
 89101 tctgaggcaa ttccaccctc tgctcaatggg gctcatggga gtgcttgctt catagctgtg
 89161 ttgagggtcc aatgagataa tttaaagaca aatttgataa ctgttttctt tgaagttagt
 89221 ggaaagatta attcaaaact tttagtctca gtttgggcta ggaaatgccca gtgttatctc
 89281 aggtgtactaa cataagttatt ttaaaaataa gatgcttttt gctttcacaa cgtgactcaa
 89341 aagtaaaagc aaaaagttag ttcagaagtc aaatgtaact caatagttctt acagtgttat
 89401 attcaaccaca gaagaactca gggttctcct tctgtaatga agataaattg actgtctgag
 89461 ttctgatcaa tagttggctg aaccacaga tgcagagctt gtgaaattgg agggccagct
 89521 gtctctcttt ttctacagga agacggcata gtttaattca ttaaaatttg taaaactaca
 89581 taatatctgt ttcaatgaca aaaagcaatt tcaattatat ttgaatgac atttacaata
 89641 acataaaaaa tataaccRtc tcacaatact ctcaactacc ttgacataac agcagagagaa
 89701 agcttgattt gttaagggtat tgcttttgct cattttgttt aaaaaaactt ctttttctta
 89761 aaataagaat tatggaatca ttaagtttta agcaataaga agcaataaga tgaacaagaa
 89821 tcttgattct tcacttctgt ttaccacaaa agtcaacttc tctctgattt cagtcocaga
 89881 aatcaaacca gtgaacacat cactatgcag agtcaacttc catgttttta atggaagttt
 89941 tagaagctac agatgaattY aggaagtata ttaaaaccaag accattaaga aagatgactt
 90001 ttcttaagta ttctaactcc tataattcaga cacacatact cacacatact ctgtgacctt
 90061 ccaacttggtc gtctgtctca tagacatttc aaactcata tatcccacaa aagaagctta
 90121 gtatctctccc tccaccccaa attgctgtac tcacagccgc ccccatctca cttctgatgt
 90181 atttctatct ttactacact taggccactt cctatttctc ttaactctct ttttttgtt
 90241 attattttta aattccaact ccaatcttgc tggttctacc tcaaaaataa ccagactcta
 90301 attactcttc aactctttaa ctgctaacc tttgtccatg caccagcatc tctcaactga
 90361 gtatttcaat gcctctctaa ctggtctctc tcttccactc ttgtgctccc acagtctatt
 90421 tccaatcacag tggccaaagg gagctgttaa atttaaagtc agatcattgt actcttttgc
 90481 atcaaaatct tcccctcaat cccagactct ggggggaaag cccagagctc acctatpcca
 90541 acatggccct ccaggatctc acctccaaat tactggctcc atgttactcc ttgaactata
 90601 aggcgatgtt ccgctttctgc tctccaggc ttccccatgt ttgctacatg tgaattatc
 90661 tccactttct ctccatgaca gctgccccta ccagctcacc taccaccact cctccactct
 90721 gtgctctgct cctcctagcc cgtctagact tcttttctca cagcatgtat ctctctctaa
 90781 tctctaatat acatcaccta gtatttttta gattttatgt tttttgtcca catcttttaa
 90841 ctggaatata agatccacat ggaagatact taataaataa atctgaaata agggaaatag
 90901 ccaaaccaaga aaaaacaaaga gaaaaaactt tgaaaacatc cagtgctccaa aaaaaggtct
 90961 tatgattttt ttctcttttt ctcttctctc ttctctctct tctctctctt tctctctctt
 91021 cttctttctc tctcttctct ttcttctctt ttcttctctt ccttctctct tctctctctt
 91081 cttctctctc cctccctctc ttctctctct ggtgtgagtc ggtgtgagtc gaggctctac
 91141 ctctctctgc taccagggtc ggagtgagtc gcttccctct cctgagctct cctgagctac
 91201 ctgagctgtg tgggtccaa gcttccctct gcttccctct aatttttgtt agagatggg
 91261 ggtgaatgac accaaactgc gctaaatttt aagcaattct cctctggctc tcttctcact
 91321 ttgccaggc ttgtctcgaa ctctctggct cctctggctc cctctggctc tcttctcact

91381 agagtctctgg gattacatgc atgagacatc acacctggcc aggcctttgtg atttctaata
 91441 gcaggaccaca tgtattacat ctctattttt aatttttaata atgtttgttgg acttttgaag
 91501 agggagaccaca acaagtagag cctgcacact agggagggctt gctgtttacc ctgaaaaagac
 91561 cctcaagaggt ggcatctcttg gggaggggta gaacactaca tcaagcacag acgcttatca
 91621 tagaggtctcc cacatctccc ttttatctgg gagccagagg gattcagactc agaatgtctg
 91681 agtaaaaaatt cacaagagcc tgcctgggca cccggaatct acaaaatactt cgcattttct
 91741 tccagtgaac atgtccattg tccagaatat accctttctga gctaatgata cccaggaagt
 91801 tgaacttga ttcagaatgt gggtcagggg tgttggaatc agtgctaagg atgctaacc
 91861 ctcttcagaga ctgcttaatc catgcctggg tgagccctga taatgcacata caacagacac
 91921 tctcaaaaag atcttcaatc atacttacca atccacact atgttccaca gattcagagc
 91981 ctattttcca ggccaatact gggcaaccat tggaaatttt tctctctctg tccatgagga
 92041 ccagttcatt gccacaaccc tttctccagg taggatggat tagctttcta cccacaaaat
 92101 tccaaccata tggctgtgct gtcttccagg aattacgtag agtctacttt gctggagttg
 92161 tggaaagttcc tcaaatcttc aatctgttac tctactccca ttaggcacag atctggcttc
 92221 tgtatagctcc agaggtgcac ctactttcag attcccaagt ccttggggccc ctctcaactt
 92281 tcccccattat gtccaccagt tgtagccagg ggccttgttc tgcacccctt accatcata
 92341 atgagctact ttgaccatag acaaatcacc taactctctc gggccttagt tccaatact
 92401 aaaaaataaaa ggataaact ctctaaggct ccttctagt tgaataaact caagattatt
 92461 tttttctcac ctctttaaga ttaaatgat gacaacagca tcttttctaa acctttcttg
 92521 agggccagatg tctctggcac tgaagtagag gaaaaaata atgtttctga accctaactt
 92581 ttttgccttt tagagaaaaa tatctctctg cctttttagt tccccctccc ttcacagtac
 92641 ctctttagg acccttaaa gaaagtctta aaacatagag aggtcaggcc aggaataag
 92701 cttaggacta ggggttccag actgcagtgt gccactgact taccgtgtaa tagcaactg
 92761 accccagatg gaggtcggca acatagtgag tctctctta tcaaaaaaaa cccaactatt
 92821 tatctctctc gattcatcag gatcttataa aaacatgtg tattttccaa atatttttc
 92881 ttcataaaaa cctcttaaac agttttattc tgaataacta tcttctcag ctgactttc
 92941 ctctgttttg cagggaagcc tattaatgc tctggggaag aggaataaaa agctcagaga
 93001 caggggccag gaaggaagca tgcctgccat gtaggtaaat gtctccctga actgtcacaa
 93061 ggtgatgggc atgaatggc agaggcgaaa gtagggagtg gagagaaggg gaaaaagga
 93121 gggaaagaa gaaagtctga aagcatatat tgtttgctta gaaaaaagt ttaggaggg
 93181 tctgggtgca gttcaagaat gtctacttag ttagatgact tctaaactgg gacttgccta
 93241 agaaagccca cgcaggag gaggcgagg gaggcgagg gtctctctcc tttagcacgc
 93301 tctcatctag ccttcccgct agcaggctgg tgaggtattg agcagccctt ctattggccc
 93361 cgcaccaggt ttcagaaagt taagttaatt ctacaggtct ctaaatgctt caaggcacg
 93421 caaatctatc cattgtttgc ctggaataca aagaagacat ttaactagca accccccca
 93481 taaagcagtg acttactgaa agaattacag tttactagca aacccccca atgaattct
 93541 atgtataata catgcataac ttcttagtct gaagatagca gtattccaaa taattgtag
 93601 cctcaagata tcaattagtg acttctaatt taggaacat tagtctgata gaattctctc
 93661 cattatacac acacacatc acacacgtat atttgttgtg gcgacacat atctactat
 93721 aacaaatgac tctgttttta agccactcta ggttcaaaaa caatacaatg agttaactta
 93781 aaatagtcca tattaatac tgggcatgaa cgcaactaga aaggaaagctt taactacac
 93841 agaaaatgca aaaaacaagt ctggttaagt ttagcttagt tagactagct caaagcatga
 93901 gctctctact agcatgtaga aataacaatc tgagtgttaa tgtgaatacc tactgtgaa
 93961 ctggtactgg atgttgtata agctgggaac agatgcctct taattctgct ttgttgcct
 94021 atgacagggt tctacttcaa ggactcatct ttccacagt tttcttttct caggaaaaag
 94081 ttctctatga cttctataga caaatgcaac tcttcttgc attttcttgt tcttctttt
 94141 gggagaaggg gacaYttaga gctttttttt ccccttttaa cagcaccaac cttctgactg
 94201 atgacagaa agagggaatt tgaatggcca gagtataaaa caactagcag actatagga
 94261 tcccttccctt ggttagagt taagactatc attagtattc atgattttt tagtaggga
 94321 caacatctcc agcaaaaaga tcaaccacac gcactgtgct aggcgctgta tcatcttt
 94381 cctacactct ccttgccacag aatctgtaat ccaaacactt accatggtca cccctccaga
 94441 atagcccact tggcttctgt ccttttctgt ggacacacgc ccaagtcccc tctgcactct
 94501 tactgtctag aagcaagaca tgaacatttt gtttgaggca tctctgaaga tccctgaat
 94561 tgaacttata atatgaggt tcttcaagt tgtgttttgg gaggaaaggt ggtataagaa
 94621 gacacaattg ctggaattat ctcaagaacc aatacatgaa ttaacctatg ttcagcaatt
 94681 cacttctctgg ggaacatacc aaggaaactga atccagatc tcaaacacc ctgcaaac
 94741 acgttcatag cagcattagt cacaacagcg aaaaagttag acagcccaa atgtccactg
 94801 atgaatgaag ggataaagaa aaatgtgata atacatacaa atatgtttgg ccttaaac
 94861 gaaggaatgt ttgacacgtg ctaacaacat ggacggaact taaggacatt agcgttaagt
 94921 aataaaagca gaacagaaac gacaaatatt atataattc acttatatga acgtactaga
 94981 aaagtcaaat tctaagaagc agaaagttag atggtggctg ccaagagctg ggggaaggg
 95041 aatggggagt tctgttttaa tgggttttaa tttcagttt gaaataaaa ggggtctgga
 95101 gattgtgtgc acaatatgaa tatacttaac gctactgaac tcttcttaa tggttaagt
 95161 gctaattttt gttatgtgtc ctttatcaca attaaaaact ccccaaaaac tatagtttct

95221 agtatttccc aatatgatgg tgataacaat aatacctttac aaatgtccgg gaactttttt
95281 ctgagaatac cagagacctg gccctccaga ttgttccatg ccaactcaaa acgataccaa
95341 ggatggagttc agttgtaaaa gttgcactta tcagagttta actttttttt ccccatagtc
95401 atgaattgtt gtatatatac acctttttat cctctgaaa ccagggtcac tcaagactat
95461 gtggatgtcg acccgcaagt ccactctggg attatctggg atccaggag gaaggacctg
95521 cctatgttga ggaagaagag agatttgtga agttagcctc attcctcttc tatttagaga
95581 gtccaggaag gtgtccatac tgttctctcc caaaaattt accatttttt ctccagatta
95641 aaggtagact catctctttc caactttgac tttaaaatYa actcagattt ccaactggga
95701 gtcattccta tctaaaaaatt acacacaaga ttaataactc aggtgccttc taccgggcat
95761 caggatgtgt taccctctgc cattctgtgt cctccactgt tcttccagaa cctccaggtac
95821 agaggttttg tataatgatg acactttata agccattttt tgcattotcaa acacaatgga
95881 acacagcgca gtgaaggtgg

BVES genomic sequence (SEQ ID NO: 4)

>6:105556851-105654950

1 agggcgagtc acttgaggtc aggaagtcaa gaccagcctg gccacaatgg taiaaaaccca
61 tctctactaa aaatacaaaa attagctggg catgggtggc catgctgtga gtcccagcta
121 ctcgagagcg tgaggaccaa gaattgcttg aacctgggag gctgaagtgg cagtggagccg
181 agatttgcgc actgcactcc agcctggggc acagagcaag actccatctc gggggggggg
241 Rggaaaaaaa ggtaaaagtaa aggaataaa aacagcgatg atttctctat ttatcatca
301 ctgtctggcg acagtggcac atgtctactt gaaagaatca tttagggcca ggtgttttag
361 gctgcactgt gctacagtca tgcctatgaa taacctctgc agctcagcct gggaacacata
421 gtgagactca gtcttaaaat tttttttttt cagaaattca tttttcaata cgtcttatta
481 aaataaatag ttataaataat tattatatta taattatttt atcttttagt tagtttgaa
541 ataggtccca atactatgaa agatcaaaa gtttcaagat ataggaaaaa caaaagcact
601 gagaagaaaa aaaaaaacta aaattgggtc caataattca gtgttaaagc tagttgggtg
661 aatagaagac tctgtgccta aaagtgccta taaatgtttc ttgcatctta ttagtgggt
721 ctgtgtgtgca tatttactgt atgttaaagg ataattttca aaaaagcgag cattatgatt
781 tttatgcaaa tatcagatga Rtaagtgtta aagaatttat tgaacacagt taagtggag
841 aaccaaatgt tgtaacttgt tcaaaaggaga atcaagaat agacatatgt gtatgcaRg
901 tatattgaca tgaatattga aatgaagcca aaactggctt ttccacagat ggggaaggga
961 aatcagttga ctctccactc tccaggatag aaattgcccc tctgtaaaga aaaaatgatt
1021 tgtattttca tcaagtattca gtcatggaaa gagctataaa ataacctctt tagaatcaga
1081 atcagataat ccagaagctg ggtccagat gtttccactc gaagcacagc ttccccccgc
1141 acatatattg cattcatcca aattacatgt caaacacata aagagaacct tacattcaga
1201 gtgtgtaattg gcaactgccat ttgtagctat ttgtatttta aatgtttatt tctgaaata
1261 aaataatttt ttgaataaaa ggctcaagta ttgcccacaa aaatttaacct ccttttacca
1321 caccagttgt ggtaataatt aatatttttt aagaaaaaat ctgaaaaaaa atttttagtg
1381 tctttgtttc tctttgtcca ctgaagaaat aagccaaagt ctctcatggaa agttctccca
1441 gccaaatcca gaggggtgacc aaaggagatg aaaaactatc attcaaatatc ttaaacaat
1501 tactcatata taaagcgatt tttttggctt acagaatatt tgcataataa tctgtttaa
1561 tgtgaattct agccctaagt attgaagtt attgaagta ttggaactt ttaaacaat
1621 ctggttctat ctggggatct tccagggaat caacggtctc tcccatactt accttcagat
1681 tttacctcca cagtggtctg tgtattcaca ggttcacagc ctgcaaatgt ccaattcagat
1741 agacaagatc ccttaaggga tcaagtatca gagaagaat ctgtaggagt gtcttagcag
1801 ctgaccatc aggccttagt cataaaaaga ttaagcatg aagggcaccc tcagtcagca
1861 aggagggaga aaggaaagtag ccatgagccc aagaacacca tacaagactt tactctgagc
1921 tctaattttt aaggtaagac ctacacaaga gaagataata tcacagttta cagagtttga
1981 ctgaacatgt tagcaatttt ccttgttcag tttttactta cgtcataggt gaacagttga
2041 agaaactgctg attcttggca aaaggcaata tatagctgt cactgggaag Scagtttggc
2101 cagagggaga aatggacaga ggtcatttac ttctcatctt taactcatcg ttttcccttt
2161 cgttagctgtg tctgtgaagt ggagacccaa cttaatgatc attagaagcc ttctctttct
2221 gacttgagca aaatggtttt aattcctctt catgtgtgtg tagctgtcaa gacaggtgat
2281 ggcttgggaY atttctcttt tggctttctg acatgaattt gtaactgagaa cacattttgt
2341 ttaaatcata ccaggcactg tgttctaaga ccaactggccc tctataaagt cttttaatgc
2401 ttcatcata acatttgtca aaatggaaag atgattaatR ttcttacta attcaaatc
2461 gtaataataa tgcagggggc tgggggtatt ctggtccaca cctgtaatcc cagcatttga
2521 ggagggcaag gtagggtggc cacttgagcc gagctcagaa gtcgcagacc agctcagcca

2581 acatagtggag acctcgtctc cactaaaaat acaaaaaatta gccaaaggcat gccggcacac
2641 accgtgtagtc ccaggtactt gggaggctga ggcaagagga ttgcttgagc ccaggagtgac
2701 taggctgtgag tgagctgtga tgggtgccatt gcactccagat ctgggtgaca ccgaagagct
2761 ctgctctcaa aataataaat tagttagtaa gtaggaaagt ctagtatgta tagtaataagtg
2821 ctagttaatt agtagtcagt cagccatata ccaatgagga ggtgttttaa cacttgcatt
2881 tctgtaaaac tcagattcta ccagcattat tagttgcac aaaggttaacc catctagagg
2941 taaactctaaa gctttgaata acccagaaga tatttacttt gcttaaaacta gggttaacatc
3001 ttttaactcta gcgcctcttt gccctggctc tgcaaaacaac cagtaataat ttgaagctgt
3061 tatctaattc tgtatgtaca gtacatcagt catgccacca aaattgattc ttgacttcta
3121 tacgtctctc ttctcttttg aatttctcat gtctctctct cctctctgtg ttttaagtgag
3181 aagtgtagtg gataaaaatg gagctagtca ctattttata gtcccttattt tgataaccta
3241 aggtattttt aatatgggtg taaaattctt ttatatattg tttggacatt tacacttact
3301 tctctagata acaaaattatt gcctcactta tcaggtaact atgatggaat tcttcttata
3361 aaaaattcttg tgctctggctc aaatgtccta atagtaagac attttacata taattttata
3421 tgtaaaatatt gactttaaga tgacttacaa aataatgta tattaataga taaaagaaat
3481 gctggctgca gaacaaaagc ctaaaagaaa tcatgcatg agaagaaaaa aatatttata
3541 agagtttgaca caaagctcta gtggaaattg atttcttcag gctgaggtga tgcttattca
3601 cagcagatgt cacacctctg acactgtgaa ttgaaatag tctggtgaaa aaagcaagta
3661 gccctgtatg ttttaagtct tcggcaaggc tgctctaata aatgaacaaa catttccaga
3721 ctgcatatcta taactgtatt ctctcatcta agcaagcacc taattttaac catcttcaag
3781 taagtctaaa attgaagctc ttcccttctc ttcataattg atagtatgac taaactttta
3841 aaacactttta actcaagggt cagtaagacc aaatagagtc aataaaactga tcttgtctcc
3901 aacaaaggtg aatgtaaaac tgcagttagg atagttaaaa cactacaaca gcaaaagtgc
3961 atgtggcttt tatttatttg tgtatagtgt tgtgtgttac tcttgacatt aagttatctg
4021 cttagttttc ttgggtttctg aaagcagcac tggcgagta cccactgatg gtgagactgt
4101 tgcctttctc ataacaaaat gcttttactc cccagaaatt ggaatcatg aagttactg
4141 tgttttgagta atttttctct ctctctcttt tttttaaact ttccattagc ccagaacaga
4201 ctactgtctg agatgttgtt ttatcatgta agagagagat aacatttcta ttgtaaataa
4261 agttttaaact tatgacctag aattcattat tatgtcctt ctcaagttac agtcaaaagt
4321 agaaaaacttt catcaaatga atattgttcc atgtattga ccagaaatct agtcttact
4381 tttaaacata atggaatgat atataaaaa gtctgtttta tagtatagcc tggatttaag
4441 acccttatat gaaaaatgct cccctttgcc cccatgctc cagtgaattc tctcccctc
4501 catgtcttgt ttgcttttaa aactgctaca tgtttcatcc ccatttctca gtgatctgca
4561 caccacttca ttacataccc attcccgcga ttttctctct taaccttctg tttttaaag
4621 atgatgaaag gtttgtgaat agagctatta ctgtattta gctggtttc agtatacttt
4681 ggtgcatttt cactgatgtt atgagatagt tgatggcatt aatcagagata agtgctcaaa
4741 agcttaataa cctatgacaa tccaaaaacc agtcaaggaga agatattaaa tagataaaa
4801 tgtgttaaat ttaacatccc agcttaactat tcacatact tctattgaa tctaatacaa
4861 agttgtgcat atagtagata ttcttcaatt ttttgtcca ttgtgtttc atttgattct
4921 atgaaaatga taaatgaat attataagca gttgaactca ctagcagaca atgtgcttag
4981 ttaattttct atcatataat cagatgataa aagaggttag aacagtagtt gataaatttt
5041 tttaaaaatt agttaagtgt gtctgaacac tgagctttag gggagacata gtagtattct
5101 tctcactgcc agcagttcag agtttgaatt tactttggt ccatgagacc accgggtgat
5161 cccgtgctgt tacgctgaat agtactggac aatacagagc attccaacaa cagacttatt
5221 tatgcaacag aagaacacaa atggcaatla tactaaactga attttgcttt tatttgata
5281 atactgagca cctaccacata ggggtgtctg attaaatagg tttaactatt atcttttatg
5341 gacttctctt tctttaggtta tggaaaaacag tgagcagtag ttacttatt aatggcata
5401 ttttaagcac aatgtagttt agatatagg gttttgaaaa ataacatact ttaactattt
5461 ttaaaaaagc agagatctta ttatatattt actgacaaga aagtaatttt ctattttaaat
5521 gccaaacagc gcgcgatgca gtggctcaac cctgtaaccc cctgtaactt ggagggccag
5581 gcaggcagat cacttgaggc caggagtttg agaccagctc gcccaacata gtgaacacct
5641 gacttctaact aaaaatacaa aaattagctg ggtgtgtgtg tgcaaccta tgaccagc
5701 tacacagaaa gctgaggcat gagaatcatt tgaacctggg aggttggaggt tgcagtgagc
5761 caagattgtg ccaactgcaat ccagcctggg caacacagtg agctccgtgt tcaaaaagc
5821 aaacaaaaaa aacaaaaaaa cagaatttgg ccatggagag aaacgtttgc aagagactgt
5881 ccatactaaa caaatttata tgcgttcaa gttgttcaa gatgtaggca atagaagatg
5941 gagaattaaa agagtattta tgggaaatca gtaattgtta atftggtaag atgtgaaat
6001 ttaggaaagt tagctattga ttaaggagct gtaaatttgc ttgggtcagat ggctcagccc
6061 tctaattccca gcactttgga gaaccaaggt gggagattta ctctacaaa aatttaaaaa
6121 accagactgt gttaacaaagt gacagccgtg gggagattta ctctacaaa aatttaaaaa
6181 ccaagcatgt tggcacacac ctgtagctccc agctactgag ggaactgtgag ccttgattat
6241 gccactgtag tccagcctgg ataacagaaa aagacctgtg ctcaaaaaagc cctgaataag
6301 gtaagtattc atccatttgg atgacacaa gttataactga acctgttctt gatgtataa
6361 ttataatttc aacagagaaa ccatattctga agttaactga actgagtttt tgcagttgtg

6421 gccttccagg gatcagtgat ggtaaaaggt tgaggagctt ttctgccatc acaaccagaa
6481 atttcaagga tccatttctca ataaggaat aagagatata tacacacatt ttcttccctc
6541 cttctgtact ccttattttc cttctctttc ccttctctct tccctctctc accctctccc
6601 cctcttcttt ctgaagcag agtgaagtaac ctgttgaaaa ctgtttttag agatttttga
6661 tcttttgtaac cacatttctt atagtggaaa atattgtcag tgcgacactt aaattgttta
6721 atagtgttag ttctcaagta gctgcacatc accctctctt gggaaactct aaaaagtcta
6781 gatgcttagg gcatcatctt caaagattctt ggttttaatt gctcagagata ggacactagc
6841 attagtattt ttgaaaagct ttcaaaatga ttctgagtca ctgtgagaca ggtctcaggt
6901 cagatgacta acaataataa tgaagggtcaa ttacacaagt gcaatggggt tttaataa
6961 taattgtctt ttitttaatta cacaaaaat atactcgttc ttctcttgat tttaaaaa
7021 aaactatata aaaatttaca gagtaaaagt gaagtgcag ccaggccaagg tggctaatgc
7081 ctgtaactct agcacattgg gaggccaaga tgggaggagc ttcttgagcc caggagttag
7141 acaccagctt gggcaacatg gcaaaactct atctctatca ataaaaccac acacacacac
7201 acacacacac acacacacac acacacacac acacactggt ggtgtatacc ttgtctca
7261 gctgctagag agtctgaggt agaggatgat tgggtttggg aggtccgggc tgcagtgcg
7321 ccttatcacg cactgcact ccagcctggg caacagact agacttatc tcaagaaaaa
7381 taaaatgcc ttccacgta ctattttccc tggatgtaac cactctttat ttgtcaattc
7441 actgtctctc ctccagtggt ttittacatt cactcatcca ttcttaoatc tgcaggagat
7501 ttgtctgtct acccaggctg gaatgcagtg gtgcaattcc agctcatcgc aaactctgcg
7561 tcttgggttc aagcaattct ctgcctcag cctctgagc agctaaaaat ataggccagc
7621 actacacgct ctggctaagt ttgtgtttt tagtagagac ggaatttccac ttgtttggcc
7681 tggctgtgct caaactctct ctgacctgtt gatccggcca ctctagacct cgaagtgtc
7741 gagattacag gcatgagcca ctgcaccggg ccggttttta catgcatattt aaaaagcaca
7801 caattactta taatcatgtc taagtctttt gaacataaaa agcttatc tctgatttat
7861 gtattatgoc gtggtttgct ttitttaactt acaattttgt ctggagatc tttsctatgc
7921 aatacatata aatttacctc aatttttaaa aaattatttc attattctRc ttctgcgaa
7981 atgttttttg gtatatgtgg ctttaattta ttittcattt taacaagttt atagcttaac
8041 aataacaact agttattggt agcattatta ttataattta attattctaa ctttttcaaa
8101 gtatggacaa tgctgttgtt aatatcttag taccgtgaatc attgtgttta tcaagttaat
8161 ttctctgtaga gcaaatctct agagtgagag ttactaggtc agagatgatg ttatttaata
8221 ttttccaata tgctgtcaaa ttgtcttcca agagaggcag ttctcaattta cactcatctc
8281 aaccaatata atctgattgc aatatttccag agccttaata atacttctat actcagtggt
8341 gattttagtg gctaaactaa atttccatct tctctctttt gactgtgaatt ttattgtagc
8401 agttttagtg cactgattat atagcatatc agcttaaaat tccaatttat aattcttaaa
8461 atatgatata agagaataga aaaagtattc acaaaatttt agaccaagtt ttccaacatg
8521 aaaagtata gagagatgaa aagaaaattc agcctggcca gtgtaaaagt ttctgtttgg
8581 actactccca gtcttttgtt ttatagatgg gatgctcaaa gaaacacgct gactctccca
8641 gtaacaaagt ctccaggaaaa gtctacttca attcttttgt gctgtgtgtg gtgtgtgtg
8701 gtgtattagt gttttaaatt caagatctca gatattttag acttactat ataaaaatt
8761 catcaatttt gttgggtata acatttttat gtaactaaaa ttgaaatgaa attttaattg
8821 ttccaattaa aattcttttc tagataatct ctaaaattct tcatcaatca aatttagata
8881 ttgttagtcc caattcatag gctttggggg ttgtttaa atataaacac atttaaaacc
8941 tttagacaga tgtcagaagt ttagtgaagt ctgagtgaat tgaacctgtt tatattttc
9001 gttattacca tttaattct cttaaaagta aaagtatgtt aaagtatgtt ttatttagaa
9061 tattttgttt ttatcatgat taaggttaaca gaggggcatg atgctggctt ctatatcca
9121 aagatgcaa atgaaaactt ttctgtgttt aaagtatgtt ttattata tttataactt
9181 taaaagataa taaatcatca gtatcaccaa ctactattt ttgaaaactc agtgttttta
9241 ccactgtact tagaatatat aaaaatttaa gtatgaaaaa ctactataa aaaaaatt
9301 cttactataa attgttatgt tttaactggc ttacaattct atgaatttgg ttatgagaag
9361 aatgaaataa aagaaactaa ttcatataag tataggttga tagaggtcag taagacatga
9421 cactattaaa gagacttaac agttctgtga ctcatcaag ttctctaact tctctcttgg
9481 tattttgggg ctagtctgtt ggagtgaata aacaataccc aaagtgttat ttatgtttg
9541 tagaattcag cagaacaaaa tggggccttc tttaggaag ttggttccag gactctcccc
9601 tcttactctc agcgtctctg agggtaggc acttccatgt agattgtctc catcaaatag
9661 ttgtctgtct agctctctgt ggttctctaa taacctttct gccaccacac ctcccacca
9721 ccagctgtct gtgatccagc actagaataa aaataatag agctgagaaa tttaattatg
9781 aataacaagt attaaaacat actagataaa aaggtttaaa atgactctct tttaattatc
9841 atcaattctg gattttagtt ggactgtacc gactgtttaa tctgtgactt ttcttagc
9901 gttatttttt cctcagttta gttcctgtaa tcttttttaa tctgtgactt ttcttagc
9961 cctctgcctc ccaattggaa actttattaa cttcttctct cctctctctg cccaaagctt
10021 tttttagaaa ttctttttct gtatctgcat cttctctctg atcttctaac agactctct
10081 cttactactt ttctctgctc ctgatactgc ttactgtact atcttctaac atttctctc
10141 ccttcagaag cttacagata actgtcaaaa ttatcttaa tgccccatc agacccctag
10201 aatgtggatt tgagtttaca tataaattct taataactta aatgttcaa gtactgtgaa

10261 gaaactcctaag atacatttttt ttccattata ctttttagaca agcaaaactctg gatcttcctc
10321 ttgttgatacg cccctctctcc caatttttttt catcactctc aggatcgagga gggaaataat
10381 aactgtagtaa ttttttcaatt tacaccattg gaattattatt taaaaaattaa tgcctattatt
10441 ttaactcagat ggttgctccg ttgtctcagc tccattattg ctgatatcat ttgaaataat
10501 aaatctgctta ttccagttgtt ttgatcaaaa aatgcaaaaac ttttttaattg tcatagcaga
10561 tctaaattcgt gattttctgaa ttagttttca ttttttgatg aaatccctcag aaatttgggt
10621 atgtttttgat taacttatta actagtgtag gtgtttggag ttgattttta aaactcattg
10681 taatttacttc agaataataa taataagttc taagggtcta acaaatgttg tttttttatt
10741 ttaaccatca taagtgcctc tttcttatcc attgttgcca tcttttcatt taaaattctt
10801 tctttttttt gagacagagt ctgcgtctgt Ygccaggct ggagtgcagt gggtcaactt
10861 cagctcactg caaactccgc ctctgggtt caccgactt tctgtcctca gccctcccaag
10921 tagctgggag tacaggcccc cgccaccatg ccggctaat tttttgttat ttttagcaga
10981 gacaggggtt caccatgtta gccaaagtgg tctcgtatct ctgacctgt gatctgccca
11041 cctcgccctc ccaaagtgtt gggattacag gcgtgagcca ccgcgtcagg ccttaaaattc
11101 tgaaattata aatcttattt tgatagtgct tcaaaaatgt tgactttgat ttgattgttg
11161 attatctctt atctttaaac gctccttaaa taagaaataa tactgttaga atatgtcaga
11221 tcaattagaat tacagtattt ataaaaatgat tttatgaaga acttgataac cgtctaaagt
11281 taaactgaac atttttgtt attttactt ttgtttttaa aacagagata gccctgtgtt
11341 cccaggctcg aatgcagtga atcaactctg gctcactgca gccctgtcct cccgtgatac
11401 agcaaatctc cgcgccagc ctctcgagta gctggaaacta cagggtgcct ccgccacatg
11461 tggctaaatt tttgtattt tagtagagac agggttttgc catgtttgccc aggcgtgtgt
11521 caaactcctg acctcaagt atctgtccgc ctcaagctcc cagaagtgcg gggtatcat
11581 ccatgagcca ctgcacttg cctattttat cttattttga atgcattgaga aaatattcctt
11641 ttgtgcaatt gttcagcatt taataaagta cttagcatga taatttttat ttatttatgt
11701 ggactatggg aatatataat aaagtatgag tatagtttct ttgttagtgt ctttttgttg
11761 agactatgct cttatattc ttaagcatat agctaaaaat ggcacacat gatattttga
11821 ttgctcacat acaatgtaaa attcattcca actacaaagg caaactgatg tggaacagtg
11881 tggagggtga acaaggggga ctaaaatcat gtatagcttg tatggagtat atagtgtgtg
11941 tataatttgt gagctgcaag gtatgtgaac atttctattt ttgtgtcagt cccctgggaa
12001 ggaaggggtt tcaaatgga gagtgatctg tactcttagt tactcttagt ttaaggctaa
12061 gattaaatag aagagaatat aaataccact cctcccccct ttaaggctaa cacatagac
12121 actaaatgca aatcttttca atgtggaaga aagctctggcc taatgatagc gacactgagt
12181 aaagccaagg ggtggaatt actatgcaga tcaaaatgta aggaaccacaa aattatata
12241 catccttaaa aataactttt atagcccaaa tctaalgta atgcacaga tagaggtgaa
12301 ttgaagatcc cattttgtga agtagaatac tgacatcagg ctctgtgtca atgagtgggc
12361 aaaaatggtc ctgaatttg ataacacagt gcataccaYg gtgactgata aatttgatgt
12421 gtctgcagga gagccagccc tattactgaa gcccttaacc tattttctgt ctttttgaaa
12481 atgagctcct gagtgggaat tatcctcaag gaagtgaatt taattcaaaa gaagatattt
12541 tatagatggg caactttaat ttaagaattc acttatctat ttgtagaggag aactgtgtgt
12601 gaaaatataa tattataagt aatgtgtgta tatttttcaa atatgtcatt ttttgattt
12661 attttgagaa cctgaatttt aagcattagc aagtaaaatt tatattttaa tttcactc
12721 ctttagaaca tatggctgaa acaatattga actgtcactg taatacttta ttaagatata
12781 taattataga atgaataatt taactacaac atgtgatttc ttgttttttt ttctctttt
12901 gaaaatagca ttcagctctgt cctaagataa atactgtta atactgcga atagataaaa
12961 cccatcttat aaattcaata ttctaagta taaaaggtaa tatgtctaac tggagaagca
12991 ggcaatagat accctaattt ttgccaatta aaaaattcac tgttcaatt ttgccaggag
13021 ataaaaactt aaatatctta tatacactgc tttagtgatt gtttagtacct tagtattt
13081 cctatgact ataaagtga ataaattatt aagtttgatg ttctcacaca tcatcaataa
13141 tgtcatcata atcaactctt ttgtgtgagt ctggaactta gccaaatttc tcagttaaca
13201 ctttttttgt ttgttgtgt ggagatggag tctcactctg tcgccagctg tgcctcagct
13261 ggcccaactt cggcttactg caacctccgc ctccagggtt caagcagttt tgcctcagcc
13321 tcccagtag ctgggacta caagcgccgc ccatcatgcc cagctaattt ttgtatttt
13381 agtagagcca gagtttcaac atgttgccca gaatggtctg gatctcctga cctcataatc
13441 cggctctctc ggtctcccaa agtgcctggga ttgcactgga gtccacgcg gaccacagc
13501 gttaaaactt ttgttatta ttttttaaaa acattataac ctgtctgggt cagtgctgtg
13561 acgtctgtaa tcccagcact ttggaggaa cctgtctcta ccaaaatagc aggtcagagc
13621 tcaagcagac cctggccaac atggtgaaac gctactccg aggtcagagc gctcagagc
13681 cggcatggg ggcaatgccc tgttaactca accagataca ctgcaactgc gctggggcga
13741 cccaatccg ggaggcagag gttgcagtga atatatataa Ygtttgtctt tcttcaact
13801 cagagagaga ttccatctca aaaaatatat tggaaaataa aatagaagc tcttcaact
13861 aaatgagatt tatggagtca taaatgattt tctgtattta ataatcagat ttttaactt
13921 ttttttttgt agacaagtca ttaaaacaaat actaattggt tttttgttac ttttaataa
13981 ggtaaatata aatttttctt agtttcttcc ataacctctg aaaaattttt cttgtgtagc
14041 aaatttttaga agaaatctg attgaacaaa

14101 tttccttgcc aagctaaaaa ctgaactttc aaacatctaa tacaaaagga tgtccccagt
14161 ggtcattcac atattatgga cggatttcca tttattttaa atcaacctaa atccacctaa
14221 aagaagaacta atttcttaca aaaaagaaaa gaaagttaac ttttctcact atcgaaactag
14281 catgaacctt tattaatcca atctaagtat tagaagctt tcttttttta gctgtgttct
14341 gattcagaca tttactctat tgctctaaaa ttacttggtt atttgccaga tatcaatcctg
14401 acttcttgac tagactctga ctctcttata tatcaaat tt cactgcatta tcttaatttta
14461 Yacaaaaggaa aaaaattttt ccagtttlaag tggtttctac agtcaaaaaa attaacattc
14521 aaaaagaatga taacttttta aatttggctc aaaaatttgc cagtttctga gttgaattgcc
14581 acttcttgatc atgccaacag ctgtatttct acactctgtg ttttaaaact gggtctgtgtg
14641 ttttcttgga atattcgctg ccccttagtg ggtctaagtR tctttttaaa atagacagat
14701 agtgctcaaat ttaaaggaat ccttctctata tggaaagtat taataattct tacagtgttt
14761 aataactctg ttttloactg tgtttagtgt tgtctcaac acactaagttt taacctcac
14821 cagaacattt tgggtgatgat agtctttgaa ccaacagtggt aaccagtata acaactgata
14881 aatgcttttta agaaggcaca ttaaaaaaag cttaattcat tggtagtttg tgtgttttca
14941 catttttaaaa tgtgtttttg gatcatgct cctacttctt aagtggtttt catcttttct
15001 ccttgtagat gctcaactg tgggtggcctt gatcatcatg ctaaggaaatg tagtctacct
15061 cctacagcaa agaagtgcca ttactgtcag agcatcatg acatgggtggc aaactgccca
15121 ctaaaaaatt ttgcacagcc accgcgaggt tctcaggga ctaggagga cgaatccccc
15181 cctgcactct caactctccc tcgagaagtg ggaggcgagg atggctgtac atcaccacgg
15241 tttctcagg aggttagggc agagatctca gaacggtcac cgaagtccac tcaagaagct
15301 tctctccaga agtcatctat agcaccagaa gagcaaaaga aaaaaggggct tccagttcaa
15361 aaaaaggaaa agacataaca ggtcttcttc atatgttct tcttttacc ccgttgcaag
15421 tctactctcat gcaagtatag gggaacagta tttcaaacg agtagctgac ctgggatttt
15481 aactactatt ggggaactgt gaatttttta aacagacaaa tcaactaagat caaattacat
15541 ttgacagagg tgtcatgttt tatgttaatt cagagaataa gatcactatgt ctgtcaatat
15601 gctgatgtgt gagagggaga gagcctgagt ctgtgtgtgt acatgagagt ttttataatg
15661 gaatgtagac acatataata agaggcttgg tctttatata tttgtgtata gatcaaaaga
15721 cacacctctc tctataaatt tggatatttc caagaattga aaacctgagt gaagcatat
15781 agtagttttt aaatttaacc cactggagtt tttctgaatt accactctt ttattattata
15841 taacaaactaaa aacacgactg ttaccttttg tgtgaaccaa aggatacttc agatctcaga
15901 gctgcacatt atggggtaact aaaggttttt aagacatcca gtctcccgga attgggatt
15961 gctctctttt ctgaaatct ctggagtagt aatttttttt cccctttttt gaaggcagta
16021 ccttaacttc atagcctct gaactgccata agcttttttt attctgggat aacataactc
16081 cagaaaaagg aatgaattgt taatttgggc cgaatttcca ctgtttttaa ttctgtgttt
16141 aattgtaaaa ttatagtcct attaagagaa atgaagggga ggatcatctt agtggctgtg
16201 tttcagtagt attttaatat cagcttcttg taaccttttc catgttgtga ggttgttaag
16261 ggttgtgtgt gcaacagcag ctctcccttg ctaactcaat ctctaccoca ttgcttagag
16321 cagggagccc tcttatttta ctactgaaga ccttagagaa ctccaattgt ttggcatata
16381 tttttgtgtg tggtttttat tctctctgga gatttatcta atttgtttct aaaaacaaa
16441 agcagcaaa aatgaatta aatactgggg ttgagaatta aaattaaagt gatgttcaca
16501 gttgcccact atatatgacc tgcaaatgat acgaaaaagt gcagcattta gtggcagtta
16561 acaagagtga caagcctgg gcagaggtac caaacctctc cccacagaga gtcagaagta
16621 ttttatacag taactttgat ctatggaag tgacctcaa tgctattct gaagtaacct
16681 atttgtgga tacagagatga acattcagtg ccagggagaa tctctcagg ttgtctctg
16741 tttagtgatg aaactggcta ggggccatag tattgttctt gttaggtttc ggtcatggaa
16801 aaaaaaaWta ttttggggtc atcctggctc tagatgttat gggcaaattt ctgaacattc
16861 tgcaagaagg taccagttaa ttatagtgtc taatatggg aaatagatta agcatataa
16921 ttataatgta tgggcctggt ggtgtgaagt cagataatta aataaaaaa gcatgacta
16981 aatgagacat attctgctga acagtttcta ctctctctcc ccgctgtcct gctcatggag
17041 acgtgtatag ttctgctgt ttcaagcaac cacaataaga cgaaaatgcc ttaggttggg
17101 tttccagctc tttcaaacct agcttgaatt tcacaacagt gatgtgtgaa atctgcgtgt
17161 tatacctga aatatcgggt tgcgtgagat caaagcttac atttgagact attggaatgt
17221 tatagctgtg agagaagtac ttctctgctc tatgtgagga tttcaactct atttaaat
17281 tttagacaaa tcaaaagtgc attgcttaat ttttagcagg cataataagc aagttaacag
17341 taaaatgcaa aacatgataa gcgttgctca attttttaga ggttaataaa ccaggtttac
17401 agtaaaaaat caaaacatga tagataagtc acttttgaaa tccaacaaa tcttcttatg
17461 ccttatggaa ataggaattat atggacttca aaattggaca cttctctgttt acaaaagaag
17521 attcagagct aaaaatcag gttgaagttt taaaaaaacat tgagaaatga ggtctttatg
17581 ggtgcaattt gaattctctt tcatcatctt accagactaa aactagatga catatacaac
17641 ctactttatg gtltgaagtt ggggtttatt ttttataga gaataatga tatctttatg
17701 aacatactga ggacaaagaa ctltgctcag ggaactatcc atgtaatatt ttgtgtgttt
17761 ctttaccaga tagtctacag tctcgttacc tcaaaaacaa ccaaaatact tctactctta
17821 tataagtatt atgtactgat gatagttaact acctctgagt ttgacacaga taaaattttt
17881 tgaatatcag atatcagtta tctatttttt atttctgtg aaaaactctc

17941	tcctccaact	ctgtgcatat	gtgaatatca	ctgatgtgaa	cacattgttc	atttacatag
18001	gtaaaatatt	actctgttta	cagcaaaagg	ctacctcata	gttgatcata	agcacacctg
18061	tatgtatgtc	tgtccagcct	tacagggtgc	tgataattct	ctggtagaca	acctttttat
18121	ctgtttata	aatagaatt	cacaactgca	tgtttctgac	aaacacttgt	gaaataatgaa
18181	gcattctcgt	ttagtttagca	aagctctccaa	acatttccct	aaaaatca	Ygtatttagt
18241	taaaagatt	atgggcactg	ttcaacttaa	gcaaaacaga	acacgggaag	agctcttaga
18301	gcacccattt	gccacagaggt	ggaggttgga	aggggtagca	gggagagggg	tgtgtgttgt
18361	caggtattca	tcttaggcga	agagtttaaa	agaYgcaat	gtcttcaatt	gtctgtctgt
18421	gtctgcttga	agccaagcgt	attgcagcat	talagcccga	ggcacaatac	taactagcac
18481	tggcttgcca	aggaatgaac	atgcMatgcc	attactagct	attgagggaa	aaggctctgt
18541	gtgaagcatc	actttgcagg	gattactaat	gggtgggagc	caggtctgtg	aaataagtta
18601	tctcttgacc	tcacctcat	gtcaacacaa	atgtaattcc	taaacagagt	gcattggccag
18661	tctcttagcc	ctgtaagctg	atcWtttgc	acatggcaga	ctataatgaa	aacattttta
18721	tacttgggtt	tctagtcttc	actagaaggc	cttggatgta	tttttgcagt	tgaagaagtt
18781	agaaagattt	ttactctgct	ataacttggg	agtttagagt	gcaatgtaa	aaaaaagatt
18841	aagaaattgc	atgttattag	catcagtcga	ctccaatat	tgccgaact	ttttttatc
18901	tggctcagtt	ttattttgca	ccagtcggcg	cccaagttac	tgcgtgtgtg	atttagttgt
18961	tgaataggag	cccataagtg	ttaatagact	ttgtaacatt	gcataaaga	tgaattatc
19021	aggaactggg	aaatctcatt	aagctttaa	gttaatttaa	attaatttat	aaatttttcc
19081	taagaatgtt	ttatcataaa	atatattgtg	gtatttcccc	ttgtgtata	caattttgtg
19141	aagtagtgat	aagtgacgtc	gcactgaact	taattttcta	gatgtcttaa	tgagatttat
19201	tgtttttaga	gaagaacatc	ttgtttaaag	catcaaaact	ctgtctacat	agctttatc
19261	agcctcttta	agatgtgtgt	gttgatgat	ctgtgtctta	attgttgcgt	tagagttaga
19321	agttgacctg	tgattcattt	ttaaatttta	tatttggaa	aaagctgcga	gtattgtgta
19381	agtactgtac	tgtgagaagt	attatgatat	ttaatgcact	tggtgcctaa	caacttgtgag
19441	agttaccagc	ttgaaaatga	tggtgttgac	tacctcttga	atcacatcta	taccacactg
19501	gcacctacca	ccaagctggc	ttcaatttagt	atgtgttgc	ttttgtgatt	aaacaactaa
19561	gctactagag	accaagtgga	acctgatttt	ttatagtct	ttaatatagg	tgttttatct
19621	agtggttttt	aattatcctg	tgtagtattt	agattacctc	attgtccatt	ttgactcatg
19681	ttgtttacaa	gtgaaaataa	aaacacttga	actgtatgtt	ttttaaagac	aaaaaagggg
19741	tagatgtttg	gaatgcgttt	cactcgcagt	cagtcactctg	gagggactga	agcactgttt
19801	gcctttctgt	acactctggg	ttttatattc	tcaattcatg	ccctaagtct	tattctgtgt
19861	attatggata	tgttgaggtt	taaaaaaatt	acttgattaa	aaataaaaca	tataacgtgt
19921	gcattttaag	tggttttttg	agatttttta	tgatgtgtgt	tcttactaag	taagtgaat
19981	ggataaaagg	ccatttaggc	agtggtttac	atcagtttga	gcataagtta	agtggtatta
20041	acatatccct	agtggttagt	atlaacatgg	aacttactcc	aaacaatcac	atgctgaata
20101	aatgtagtct	aagtgaagga	agaaggaaag	gtgggagctg	ccatcaactca	gaattgtcca
20161	gcagggattg	tgcaagcttg	tgaataaaga	cacatacttc	atgtagttag	aagagtgttc
20221	tgaagcaaaa	tattcaaagc	ctattgaaga	aatcatttta	gaWttttct	acaagttttt
20281	tctaataaag	aatttgaaaa	gggcacaaatt	tatcagtacc	aaatatctaa	aatcacgaat
20341	tagattttatc	aaaccatgaa	tgcatgattg	atgtactgtga	acaaacgatt	tggtaaaact
20401	attgatttct	ttaaattggc	cagttccaca	atcaaaccta	ttttctcttc	tgcacttgga
20461	tgattttatt	ttttgatgat	ctgttatgac	ttttatttta	ttttaaactt	tggtaaaact
20521	acataacata	aaatttacta	tcttaacat	tttttttaa	agatgagtc	cttcttgttt
20581	gccacggctg	gagtgacgtg	gtgcaatcgt	agcttactgt	gggctcaaat	tcctggaact
20641	gagcgatcct	ccacMtcag	ccacttgagt	agcttgacta	cagatgtgca	ccatgccca
20701	ctaatttttt	tttttttttt	ttgtagagat	ggagtctctg	tttgcgcc	aggtgggtct
20761	tgaactcctg	gcttcaagca	gtctccctc	cttagctctc	caaagggtct	gcattacagt
20821	tgtaaagcca	catgtctagc	cttaaccatt	tttgattatt	aagtatatct	acattcttgt
20881	acaacccagt	gtgattcact	ttcttttgaa	gggcttttgg	tacttttgca	aatatggaaa
20941	accttttaac	ctttaaagaa	aaatcacat	aatcccatca	tcgtaagata	accaataaca
21001	gctttttatt	atttatattt	agtalatgga	attttttttt	cttttttgga	gacagggtct
21061	tgtctttgtca	cccaagctgg	agtgacagcg	ctcaaccatg	gctcactgca	gcctcaacct
21121	cccaggcttc	aagtgattct	ccagctcag	ccctccaa	agctgggagt	atagggctca
21181	accacccagt	ctggctagct	ttttgcattt	ttgttagagg	tggttaaaat	acaaacaaa
21241	aatttactat	cttgtggcct	aggctggct	tgaactcctg	ggctcaattg	atcctctctg
21301	cttggcctgc	caaagtctgt	gaattacaag	tatgaaccaa	cccggccggc	caatttttga
21361	atttttttgt	gagacagagt	tctactatgt	tagccaggct	ggctcttaac	ctctgctctc
21421	aaggatccca	ctcagcctc	ccaaagtgtt	gagaatgca	gtgcaagctg	ccacacctgt
21481	ctgaaaatct	taaaaaaaRa	aaaaatata	cataactcca	tcgcttagaa	ataacatata
21541	gcattttttt	attaattttc	tMtggttac	acacacacac	acacacacac	acacacacac
21601	acacacacac	aSagatacat	acacatgcgg	gtgatttttt	tttttttttt	tttgagattg
21661	agtcctcact	tgttgccagg	ctggagtgca	gcagtggggc	aatctgtcca	ctgcacacct
21721	cacctccctc	tgttcaggcaa	ttctccagct	ggaactgtag	gcagtgtccg	ctgcactccg

21781 ctgatttttgt atttttagta gagacgggtt caccatgtta gccaggctgg tctYgaactc
21841 ctgactctcag acgatccacc tgccttggcc tcccaaatgt ctgggattac agatgtgaac
21901 caccacacgtt ggccagtggt tatcacataga ataatttgat catbaaatag tccaattatgc
21961 ttgtgaattt aatgctgctt tttttttttt ttccaaataa agaatagctg taagatcacat
22021 ttaggataaac aggcagaccc agccagaatc ccaggctgtc ctctctgtga cacagagatc
22081 tatgtttctc accctgtctc gtgtctataa gccctttgtt aggcaccttg ttaagaagct
22141 ttgcttctcta ggctactaaa tcaaagcagt gctgtgtgat agccaccatt ttgtgtatga
22201 ttctgtcctt gctgtgctgt tatttttgtt aaacatttct caaaaactct ttgggggtttc
22261 ttgttttgtt tgctttctag aaataattga aaatttctaa aactttccaa gtgtgtctaaa
22321 tgaattttct gctaccttca atttagaacc cagtatgttg cccctttctaa tctctctctc
22381 ctctctctct ctctctctct ctacWCWca cacacacaca cacacacaca cacacacaca
22441 cacacacaca ctttctgaat taatttggac tgccctggaa atgttataat ttctctgtgg
22501 tgcatacgag gcatgtttct taacacaata taggatagtt tattgtattt atagtgtatt
22561 ttgtttctaa aattactcaa aatttcttga agatgtgggc tatttctgaa ggccaagggt
22621 ctccatttct acttaatttc tgagctctct agcatctgtt gctatatacc cctgtctcag
22681 ttgtWaaaag ttctttaaaa cacaactcc aacctggag gttttgccta ccccctaaa
22741 cacatgtgtg gttttctttt gtcaagaaga aagaagaggc tggaccacca cgaataaacg
22801 taaggacact gcccaaatgc aaagtccagg gaaagactgt ttacacattg attcttaacc
22861 cacatttctt ttgacttgg tgcaaataga catattgttg acctgtctct tcatactgct
22921 ttcttactct ctagaagtgt ggccctctccc tccactgcag atgtctagat atttcaagct
22981 ttatttatac ctttcttctt ttcttcttct tttttttttt tttttttttt gaecgagctc
23041 cgtctgttca cccaggctgg agtgagctgg tgtgatctcg gctcacatga acctctgctc
23101 cccgggttca agtgattctt gtgcctcagc ctctctgagt gctgggattt taggtgcgct
23161 cccacacacc cagctaagt ttgtatttt tagtagagac agcgttttgc catgttacc
23221 agcgtgtgtc tgaactcctg ggctcaggca gtccaccacc ctacgctctc caaagtgtcta
23281 ggatgtagta tggggccac tgYgcStgtt catttatcac ctattctatg agtcatctgt
23341 gccacatatt gagcccttat agttatcaat ctccacactg gctcttcaag ttctcttatt
23401 tcttcatgaa attaattctc cacaacttct attaacatgt tcaagataga ttttttctat
23461 tccctgttaa aactgcttct gcccaaaagc aatcaaacag acccaaaaaa tccactttaa
23521 actatattta taaaacccta attacaatca taatttctct acagttaaaa tcttggaaaa
23581 tgcagaggag gggctgcgt gtgagaagct cctgctgtgg ttgtctgacg atgtgcccgg
23641 tccacgctct acttcttag gtgggctttt ttgtgttgag gctgcacagc atttgcctgg
23701 aaacttattt cccgggaaaa tgaatacata aaccaaacag tgggaaggga ctgtggaact
23761 gcacttgggt caatagctgt tctccatcta ggcatacacc gaccatctc ataggtgtat
23821 tcccaaaatc tgcctggagg gagtccacga gttcctttag aatggaatca gtaaaacaca
23881 acaacaaaaa taagtaataa aagactgtgg gtcaatgtca gattatacaa gagatcccat
23941 tttagtgat actcaatttt ccatgatgtg attattacgc attgcatgcc tgaacaaaaa
24001 tatctcatgt accctgtaaa tatatacgcc tactatgtac cccaaaaaac taaaacataa
24061 tttaaaaaga gatccattt aaagggacca tattgacaac ctgacgtgtt tctttttagt
24121 aagacattat ttcttaatgg aacactgtcc ttactaaaaa tatcttcaag gcttatgtaa
24181 aagatgtctct aaataacaca atctaaaaag tatgtcataa tgcataccac ttgtcagtgat
24241 gccctttagaa gtgtaaaaat tctctatggt taagggtgaa gctcgagat tttaagaaatga
24301 gaagaactgtg aattcagtaa tctctgaata agatttgaaca tgatacagtt cagtttgttc
24361 ttgacacacc cagagggcac tcttcaactg ctctctgaaa cagattttct tttaacatcc
24421 ctcatagctca taatactctt ttgagtacct gaataatcac atgatgtgaa aacttacctca
24481 ggaaaaattt tgaactgaaa aatgtgtaat taaagttaat gcctttttgag cttcttctga
24541 gaagacagagg gctgtcaaca cagagctcac aatactgaag agataatcag gbatttgttaa
24601 ctgtgtctaga aaaaagtatt tctaaaagtc ttctgttaat aagaaacacc aggactgtaa
24661 acatctcaat acattaaata atcatactgc attattacc ccatgttctc tcccccactt
24721 tctcaagctat aagaaatata aaacttctcc caagcatggt ggtcacacc ttcttacc
24781 tggtttttga ggccaaccca gagggatctc ttgaggccag gagttaacga cccagctgat
24841 taacatagtg agacctgtg atgtgttttg gctgtttccc ccccaaaaac tgcctttgaa
24901 ttgtagctctt tacaattccc aggtgttttg agagggacc cgtgggagat aactgaatca
24961 tggggtttgg tcttctccat gctgttctca tgaatgtgaa gctctctctc taactctcac
25021 catttcaata aggggagttt ccatgcacga gctccctctc taactctgac accatgggag
25081 acagctcttt catcttccac catgatttgg aggcctcccc accgtgtgag attctgtgalt
25141 cccactaaacc tcttctttgt gtaaaattgt ccagttctac gtatgtcttt atcaacagca
25201 tgaacacagg Ygaatacagc ctgattctac tgaagcttag ctgggcatga tgcctttgag
25261 cagttaattcc agctgcttgg aaggctgagg caggagattt gcttgagacc aggaagtctga
25321 tgcgtgtatg cctttgatca caccactgca cctccagccg ggaRacacg gtagactgtc
25381 Mctaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaWaaagaa tgaacagact cttcattctg
25441 gttttattac tgaacacttt gatgttctc ttctcactca gacattctaa tagggctgcc
25501 catacttcca ttatttgaga agaaaacata atgtctgat atgtctgtaa
25561 ttttcaagtt atttgattta aatgtgtgtc tctagataga agttctgaaa

25621 ggtataattt aatgaagaaa tacatctttt accttcagct tccattttatg tatcactgat
25681 taatgttaata atagcttttta cttttatagt gctttatcgg tgacatggatg ctttataaatt
25741 taattttctac aaaaacctccc taagattaa atggccagata tcaattatccc tatattacag
25801 atgggttcag ggagattaca ttaactactt gggtYataac cgtgcttgatg ctagctagatg
25861 aaaaacacctt cagaattctg atttgaatca ttctctctct ccaagtaccga gaaccaggca
25921 gctagctctc ttctgactct tttaggaagt ccaagaagac aaggaagtga ggttagagatg
25981 tgaaaggatg aaaaacacac accaatgtga ttgccacat ttgcttctgt ctgaattgtt
26041 ccatccatgc acccatttcc tactagtcat tctccaaacc cactctcaact ctaactctgc
26101 tccactgtgt ttctctggct ttgtttgttt ttgtttttga gacagagatc tactctgtctg
26161 cacaggctgag agtgcaagtgg caaactctcg gctcactgca acctccgctc tccRggttca
26221 agcgattctc ctgctctcag cttcccaagt gctgggatta caggtatcact ccgcatgtcc
26281 cggctaattt ttgtattttt agtagagatg gggtttccac atgtttccga ggtgtgtctc
26341 aatctctctga cttctgtatc cgtccacact ggctcccaa agtgctggga ttacaggagt
26401 gagccacgc acccggcctc ttcttttttt tttttttgac agagttttgg ttttgggtc
26461 caggctggag tgcaatgggt Caactctcag tcaactgctg aacctctacc tccaggttc
26521 aagtgtattt cctgctctcg cctcctgagt agctgggatt ataggtgcgc accagcctg
26581 gctaatattt gtatttttag tagagacgga gtttccacat gttggcgag ctggtctgga
26641 actcctgact caagtgtacc acctgctcgc gctcccaaa gttgtggcat taccaggcctg
26701 agccaactgcg cctggccctg ttctttacag tgggaagcaa ggcatatgact gcaactgact
26761 gcaagcctcg gacctgccag gagtctccac caatcactgt gctgtttgt gcaagggag
26821 cttctggacc tcacccacga ccagagtttc tcaaccttcc tatccatagt aacacctg
26881 gaggcttttaa gctcccaat gccacagatg atggcctcag aactctttaa cctcactgc
26941 agccacggctt aacccactg tcccgccagg tgcattgtgt cagtatctgt gagggtgggc
27001 tcttgagact agacttttaa ctggttccct gagtgcctgt tttataaaaa gcttgaataa
27061 tactgtccag gagccaataa atacaaagtg cttttaactg gactgtgaac aagaattcgt
27121 gggttctagt ttcttttggg ttcaattttc ttgctgtgt ttctcactg cccaatggg
27181 gcaggggggt gactcaaaac atcagacctc aaagtgtgca agRgacctc aaaaattgtg
27241 ccttaacagc agcagcagca tctcgtcccg gcaactggc aacctctcat cttcacaaa
27301 aatacaaaa ttagccaggc gtggtgtgtc gtgctgtatg acccagctc ttggaggctg
27361 gaggtgttga gatcgcttga agccaggaga tcaagctgc agtagctctg gatagcgcca
27421 cggcactcca gctgggacaa cagaggagg ctctgtctca aataaaaaag aaagtatcc
27481 tcagcataac tttttggat caagaggtga ccaataatca cagacRtctg agctgttagc
27541 agggctctgag gaggttcaga acttctctgt ccttggtcag gtcaacatgc tctgtataac
27601 ccttaacaaa atagttgatt tgccttttaa aatatatata tctcccttt at tccacag
27661 ctggtttcaa aagctacagg attgctgttt ttgtgtttta tcttagttct ctataaattat
27721 cctaggctac gtgcaggaa ggttacaggc cttttaaaca aatggagtta gtgtgttag
27781 ttctttctct gtttcaactgt tacaccagtg ctttccatcc actgctgctc ctgtgttag
27841 ctctgcaagc tctctctctg ccagtgtctt ctggaaccac ttgtctaaat ggaattggc
27901 tcttctctct gccccaggca aacaggctca gagYgatgc agctgagagt gtggccgccc
27961 catcgctcca gccatttctg ctgtaagcag aaggagcctt ggtaataac tacaaggac
28021 tccgtctctgt gggctctggc actgaccttt acaaggctct tacaaggac tttggctgcc
28081 aagattccag aaggcttaa gattcgactt gacaaggaaa aaggggaaa agtaggacaa
28141 acatgtactg ggtgcaagct atgtgttagg aaaggttcga gtgtacatgt gaggacacac
28201 tggctctcga gccctcacia ttgctcaag atcacactgt cagagccgctg acctcagaa
28261 gctctgtctc cactcccaag ccaagctcag gacaggactc tgctctctt ttcaggcctg
28321 gttttttag ctgcttccat ctatgaggca agtgagggtg aacaattgtag attaagaattc
28381 agtttgggac aaaaataact aggaacctat tttttcacag gaattgttaa tcattttaa
28441 ggccaagtgc agattttaat ttttttctc aagaaaaatg cctctatat ataatcatgt
28501 acaaaagata gaaagtctta cttttttcta ttttagcatg aaaaacctY gataacctaa
28561 ggaaggagc tgggaaccag atacactggt ggcctcacac ggcctccctc gggcaggcg
28621 agagaaagag ggtcagacag aggcaggcct cagtctgagg ggtcaggag aggtcccg
28681 ctttgtgact tgaattgtct tggtaaacct aatctatttg aaatcactt cctctctctg
28741 caaagtgggt atcataataa ctacctgca gaattgtgt gaaataacta atactatgat
28801 tttaaatgca gctctggga aataataggc actcaataca tgtcttctc actcatctcc
28861 attacaccta attgttctta ctacaaaac atatcagcac taataagaaa agtttagaag
28921 gatcaggatg gaacaacaaa agtagtgga agcactgtg aaaaattatg gttctcagg
28981 cgacagaagc gatttttttt ttttttttgg agatRggctg tcaactcgtt gccccaggtg
29041 cactggaagt cagtggaagt atctcgactc actcgactca cgtcgactca ggtctcaagt
29101 atctctctag cccaactctc caagttagct agatttagag catcgactac cagcgtctgc
29161 tcatttttct atttttttt tagagacagg atttcccat gttggccagg gttgagcagg
29221 actcctgggc tcaagggaat tccctgctc agcctcccaa agccactcc ttagaatgac
29281 aggcgtgag caccacacc ggcctacaga agagaattta agagaagtc ggtctgtg
29341 gatgagttaa ttgtagtct gttttctgca cagtgtact ggctgtgctg gaggttgaca
29401 ctaggatttg tccctgtct gagactctc tgcggtctg cctcagcag tctctacaa

29461	aatggaataa	ttataatgta	gtcaccaaca	gttgtgaaca	gctcagtagc	ctttcattat
29521	ttgcagataa	atatcaagaa	ttaaatggct	accatcacct	ccctgtccaa	gtgccccttt
29581	atlaagagct	ttttacagtc	gtgggacctc	cattgactca	gatgtgacat	taatttagctc
29641	agctcaaac	acttttgggt	ctgttggcct	gccaatcaag	gagtcagagg	gaaataacct
29701	gaatcaagtt	gtcctctcgt	gagcaggccc	tgtagcactg	ccagcgaatg	ataagaccaca
29761	tggtacttaa	caggcagctg	ggacgagcga	atagacgaag	aaaatcagaa	agacataact
29821	aaaagtggga	agaaggtaaa	ttttctcatg	acaggtagaa	gaagaagctg	gggagaaact
29881	ggaggtcag	gggatatatt	tgctcctggc	gaatagcaag	aaaattataa	cgtaagtgtt
29941	aaatccagg	atccagctgg	gcacagtggc	tcacacttRt	actctagcga	ctttggggag
30001	ccaaggcgag	cagatcgctt	gagttcaggR	gttccaagacc	aaagctggaa	agagctgaga
30061	ctctccattc	aacaaaaaat	acaaaaatta	gcggggcata	gtggccacag	ccctgtagtc
30121	cagctctctg	ggaggccgag	gtgggaggat	cactggaccc	tggcagctcg	aggtcacagt
30181	aagctgagat	cgacccactg	cactccagcc	tggaataacag	agcaagagcg	tgatctaaaa
30241	acaaaacaac	aaaatacaaa	aaacacaaaa	caaatccaa	gacccactgg	tagagcaacc
30301	aagaggacgc	tgctatagat	gacatgggaa	ctgtgaacat	ggcccaaaac	tggaatgaga
30361	acaagcccta	agcatagagt	aggagttagaa	taagttagaa	ataagtctgt	ttctcagagt
30421	tgaagcacaca	gcttgagaag	catagttaga	tcccatctct	acaaaaaaaa	aaaaaaaaaat
30481	tagccggagc	tggtggtgca	cccttgggtg	cccagctatt	ggagaagctg	actctggggg
30541	atcactctgaa	tccagaagtt	caaagctgca	atgagctgtg	atcgYgccac	tgacactccag
30601	ctctggcagac	agtagcaagaa	ccctgtctcta	aaaaaaaaaa	aaaaattaac	caggggttgtta
30661	agggcagaact	aggaaagtga	acagaccaca	tggttttggg	acctgcgcag	aatgtgacct
30721	tggttgactc	acttaccgtc	tctgtaccca	ctctctctcc	cttctaaaaa	ggggacacag
30781	ggcctgcctc	cccacattga	cagtactgtt	gacgggtcaa	atagataagt	gaagagacct
30841	tgctagattc	aacgatgac	tgaagagaca	ttgagacctc	agcaaacctc	cgctctcttg
30901	ctgcccatca	accagccata	ttgtgtgcac	aaattcttgg	ccacagaggg	cagcaaaagg
30961	gggaaagaca	gatccacaga	gggtgtggag	tttaccctgg	gggtgagaga	ggatgtgaga
31021	gtgcggcctc	tttgggcaga	gggtgggtca	cggtgtgata	gttcaggggg	tggaagaagt
31081	actgtctctg	ctgggtgcgg	gtgactgggt	atgggaaggg	cttggtagtc	cggtgagcga
31141	gtgcggcctt	ttctctgcag	gaaagggaag	tccatcagaa	ggttttcaat	gttctgtggc
31201	aattttcaga	ttattctgat	agcagcacaa	aggtcgactg	gaaaaatgat	ggccagaggt
31261	ggagaacaaa	gggtgggttc	tattgcagga	accaggggag	agccacaggg	gtatagaaca
31321	gagggcctta	gagaatgatg	aaattcatca	ttctgcttaa	aaaaataaac	cttttagacta
31381	ttaacatgaa	gaacgttttt	ctatttataa	aaatttataa	ataactattt	tataaaacaa
31441	aaaagtgtag	agtgcatgtg	ttttatgctt	ttgcattctt	agaggtgtgg	taaaaaacaa
31501	gagctggatt	ttcacatctg	ctctgcattc	agtagattgt	aacataatc	gttttgggtg
31561	aagtatatga	agaaaatcta	gcctcacaca	aaatttggaa	aaggggaggag	tacagagtta
31621	agtcatttaa	taactcttag	ataattgtgg	attttttttt	tttttttttt	agacagagtt
31681	ttgctctgtc	accagggctg	gagtgcaagt	gcattgatct	tgctcaactg	agcttccctc
31741	tcctgagttc	caSagattct	cttgagttag	tggaattaca	ggcgcatgcc	accacacctg
31801	gctaattttt	gtacttttag	tagaggtggg	gttttgcctg	gttgccctgc	ctggctctga
31861	attctctggc	ttaagtgtac	caccacacct	aggtccccc	aagtggttgg	attacataag
31921	tgagccacga	tgYgggcca	actgtggcta	ttctgtatc	tacagaaaac	cttacaatag
31981	tttctgtttt	ctttttttta	aggttagtca	agtgaagcag	tggaagtggg	aaaggaacaa
32041	tccttcttaa	aggttggttg	cagtggtgag	tcacaaaccc	gttttaatgt	gttcttggct
32101	tgctgcactg	gtctagcttg	tgcttggaa	agatcttata	tccatgtgtg	tgacttttaca
32161	acatcatgtg	tgtaccattt	aaaaaatact	ggctcaccta	tgcgactgtt	tcaaatgtta
32221	acacattctg	aaataaaaga	tcaaaaattc	actcaattat	tattatttat	ctattctatg
32281	ggggggcagg	gatgaggaaa	agaaaaaac	ataactagaa	aaatctttat	tatttaggaa
32341	gctggtagac	tcacagtgtc	gtctccaa	tggaattctg	tattcttacc	ccagatccct
32401	tcactgagtt	accagctgac	ttatccaa	gctgtctgta	catcttttca	gctgtctcaa
32461	ggccctctga	acttagcatg	aagaaaacat	actcagctt	tgcatctaaa	ctcgggctc
32521	tgcatgtgtc	gtggccagag	aatcacacgc	agtaacataa	gcagaaatc	ctcagactgc
32581	tcctctcact	caccaccagt	tctgtctcca	caaatagcca	agtcgctgca	gcttatctt
32641	ctgggtgggt	gtgccatgt	ctgtctacag	aaacccccca	agtggacact	actggaaagc
32701	ccagctctt	acagcacagc	cttagttag	gggaagctga	ccaaaagctg	gctcagcacg
32761	aagtctcagg	ctggaaaccc	agacatcagg	ccagatgccc	atggcctgtg	gagtgacaga
32821	atataatctg	ctcatgggat	aagatgctcc	ttccatttgg	gccatcatt	gaggtgact
32881	aggggtgggt	gtttagatgc	caaggacttg	ccactcaagg	ctgtttctga	gagctctcaa
32941	tttccatctc	aatatctagc	acagctgatg	ggagaaaaag	tggtttcttc	aaagaaatga
33001	aagactgtcc	ccctcatcca	ccacagaaac	gatccaggga	gtttttctga	ctctcttact
33061	tgactctcca	tattgtttaa	tcttaggaaa	ctagaaggga	gtgaatgttc	agatgcata
33121	gaaaaaaagc	ttagccccac	taagtcacct	taagtagcct	ctcagagctt	ctccatttgt
33181	gcactctagt	aacactgtct	acactgcctt	gtgcgcattt	ttttttNNca	cagctcaagc
33241	agcccaagat	cgaggacctt	tgaagttagg	tatgaccagc	ccacaagcac	ggcctctgct

33301 ggtctgtctca gaatacaatg gcoctgcacca ggcacactccc cacaacacttg gccctttgggc
33361 atgacattctg acaacagctag atatatgttaa gaggaatgaa ataaaaataa cacacattttt
33421 ctaagtacaaga aattttatttg atcaaatggc aatatatgaa gatatttttaa actataagcc
33481 tctatcatcga caaaaagcat cttttttata agtaagtgtt atcaattttaa atgacacata
33541 aaatcaaaaga atgagttttcc tataaatgtc tgtataaagc ttctataaaa tccctatgta
33601 ttttaaaact aggttgcaag tataacagaa aaacctataa atagtactta aaaaacaggtt
33661 tcttaaaatt tatgacacct acagttgttc actatagaca gagtattcgg ggggctctgt
33721 gacatacaaa catggctgcc atgagttaag gagcgtgtcc cctgatgagc agaacccagc
33781 gactgattat gccctcagcc cgagctcccc gcacagcatc ctacactcgg aaattctctg
33841 cagtttgggt ggagtgtaga attactacaa gaggaaggtta gaaaaccagg attggaaga
33901 gggaggggag aggaacaccaa ggcattgccag gatcaaaagt atctataaaa cagctttata
33961 aatgaccaag aaaatgggtt tctaaaaaac gcaaaatggt gggccttgg cagctgcaacg
34021 tggcattctgt gaagaggacg acgccaacgc cgctgggaag ggcctgacct gatcccaagt
34081 gctttggcttg gagccaccac acgcaacagc atgaaacttt cctctggagt ccaactcttt
34141 acctggaaaac actgggggaca ggtcagttgt tagctataac cagctttccc caaagatttt
34201 tccagcaacc aagtgaacta gcaaccaagt gactctgtct ttggggccgt gatggagct
34261 gacatgggag aattctgcagc tccaggttct aagatcagga gagcttcaga caagtgggaa
34321 aacagatata aagagggtg acatacacac actgttagca gcaaaacaga aaggtgtcca
34381 atgattaaaa tgaattttag tgatagggag aaatggagaa gatttccagag tgcacggat
34441 agtaactgaa caataattata tagcacccat tattactaat ttaagataata taagcatcac
34501 tggcggtatta tatagtgtct atgctatag tttagtaaat ataaattttt atggagacct
34561 tcaaaaattt ttaaatgaca tataacttct aataataata ttacactcca gatctacata
34621 actgagttga tgttacattt aaagttagta attttggggt gtatatggag taacttttgc
34681 agaccatttt ctgaactttg atcattcagc taagttaaag ccaaaaaaca cagggaagct
34741 cttatttggga actttggcag caaacatggt ttlatctatg tatttatgca ttatcaaaa
34801 atacacttat tcaattgtat aaatgaattt aaagtactcc ataggagatc ttacactta
34861 aacacttttc tgtcttctta tctgtcttct tgagatcaag tctataatgg aggcctcttc
34921 cttagagttg tgtgtttaa aatagttcca cgtttcccat tccagccaag tggcctcttt
34981 aagatttctta atcttgaggt tacaattctc acattgagac actgatacac accataactt
35041 taataaaaaac agcaaatggt cttatatcac actcttttag cagttgtctt ttaaaaacgt
35101 ttgtgtccca gcattacaga aaataatctc caaacacatg catctacttc tactcaggga
35161 aggatgttac aYctaatgac tgtatagagt gattttgtaa attagtctta tggcggttg
35221 aactaaatgg gctgcccaac ttaaccccaa tggttaaagg aaagtatctt cggcactatg
35281 acatccacgt tacacctgtg ctctcaggta caggcgaaa gtgagcga gaagcga
35341 gagagttcaa cctgagagag ctttataatt tcaagcctag gctgtcttc acccttgc
35401 cattttccca aaacaagctc ctaatttagc tacctgaaga gactgctga cgagtacag
35461 gaaagcagcc tttttttgaa atagggctctc actctgttgc ccaggctgga gtgcagtggt
35521 gtgactgtgt ctcactgcaa cctcaacctc ccagggttcaa gtgacactcc caactcagcc
35581 ttctgagtag ctgggactac aggtatgtac caccacaccc agctaatttt tttgtagag
35641 atggggttta gccatgttgc ccaggctggt cttgaactcc tgggcttaag caatccaccc
35701 accttggccc cccaagtgc tgtgatata tgtgtgagcc actgtgtcca ctgcagagta
35761 gcccttttca tgtgatgtca ataaacacac atctgaaagt gacaggaact gtgctcagag
35821 tctgtgtaaa ttttctcaat gagtgcaga gcattgaaat ttaactcaaa tgaaattact
35881 acaataatgt ctttaaaaac atatttagga aaatgaggtg acctagatga ctacttata
35941 tatgtctccct ctaacagaaa tcacctcatg gtaagagttg ctctttttgg ctcagttca
36001 ctgagaacaa cttcatttgg aacttttctt agccatttaa cgttaacaga gaactgaac
36061 aagttggttc tagtggatga agcaaaatag acatgaccag catggccaat caatgagct
36121 acttccagcg agcgtcctg ccaagtgcga cagccacgct ggcacagcac gatgaccagt
36181 tacgctttc ccaccagcca aatgccactg ttactaaac catgatttca gtgagaaaaa
36241 gagctctgga atcaaggccc tcaactgagc acctgggtgg ggtgtccta ctctggcctg
36301 tagtataccc tctgcttcc actgtgttgc cgttcgcagc tctggcactg gggcattctg
36361 cactttttta aagagatgt ctctgctctc agatgaacaa tctggaaact cagatcacat
36421 atcaaaagaat gaagcagatc ttctagttgc ctcatctgt ggcacctgcc cagcattta
36481 acctccctgt cctccacccc tacataaagt gtttccaca gcttgcagtg caacactgg
36541 tgactccaaa tcccaaggaa gttgagttta agcatttat aaccccgctc tcagaaaccc
36601 acttgtttat ttccagctt caggtttcag gttttgttca ttatcaagt atccacacag
36661 aatgtgagta aaactgaga gttttgttca taactctct ggctgggag ataaaaaaa
36721 agtaagggtga tctagtggag taactctctc aaatctgaa tagccagggc cgggtggctc
36781 cacaccttate tctaaaaagt cccattaaaa aaatagtaa cgtccagggc cagagagatc
36841 acgctgttca tccagcaact ctgggaagcc ctggaagcc cRtctactc aaaaatacaa
36901 Ragaccatcc tggctaacac Rgtgaaaccc gctactcagc agctgaggg Ygcactaca
36961 tggcgcgggt ggcaggtgccc tgtagtccca gctgagaatg atagtatgt atagtatgt
37021 cgtgaatcca ggaagtgagc tttgcaagta tctcaaaaaa ataaaaaatt atagtatgt
37081 ggcgacagca tgaactcca

37141 atatatgtat atatatatat atatatgtatgt atgtatgtgtgt gtgtgtgtgtgt
37201 gtgtgtatatt atggaataaaa gtttgagatt tcatgttacc ttgtgctcaa
37261 tttttaacctt acattgttttg ttaaaattat caaatggaca acctcatgtc tgatgaaacaa
37321 aaagactgtgt gaggaaaaag aatcataact tggaaaaaaa taagtgtaaa gaggatgaga
37381 gatgtctcaag atttgtttaag ttaaaacaat aatatatcta gaaaagactgt tgaanaatata
37441 tatctcaaaa gagaacaagg catagtcaaga atagacttca aacaacttac tttaaaagact
37501 gactataaaa aagggttaagt gaaagaactc ttccatcctt gacccttccc cactctctcc
37561 ctcccgactcy accagttctgt atgcactaaa gcagaataac ctaaaagcca gaaaagactc
37621 ctgtgtatttt tcaggatctc ttcaagacac ctccgtctct ggtaacctga attctctctc
37681 tgatcaaggc agctgatgga ctttcaatgt atttggagat gccggttcaa aaacgtcact
37741 atcatctctc gctcctctct ctatcgtgtt catcttgcca gaggctcgct gggtgtggga
37801 tgacacatct gtggaagaat acaggaggga aaacctga agccacaatc taaccagacc
37861 ctggtgtgat atatcaatta taaat tccaa ctggaataa aaactgtagg aatcatcac
37921 tagcagcacc aagaacacaa tttccataaa ccatcttatt tcaatcagc attctcaataa
37981 aataaccaag tcaagaagag actctcagtc agggagcacag atgagggaca gatctcaccc
38041 tgacacatct gtggaatctga cctctcaaaa tatattcagt tccaggggtt ttgcccaca
38101 gtctgtcttg gactcagaac gcatgttctc acattaatat catatacagg ggcttgagtc
38161 tcatattgac ctgtgaaagt tgatttaact cctaatttcc ccaagaataa ctcttatctc
38221 aaaaattatg aaactaatca ccatctgtaa tatcacctaa aaactttctt gctccacaca
38281 tggagtcagc ccaccactgc ggctttacacg caaaggagag agggggaagg gaaagaggc
38341 caggcatcca ggagggacaa gccaaagtaga ggaagaccaa tccaggcgag caggcagcca
38401 aaaggcaacc ccagggcctt ttaggagtcc atttaacaa aggaaccagg cagcaatcca
38461 ttcatctagt cactcactgg ttcatgcatt caccaaaatg tttatcaagca tctaccatat
38521 atgtgtgacc atgtctgag tagaagaaaa tactatctaa agtcaaaagt agaatgcat
38581 atcaaaagcg ctctcaaggt gcctaatag cagctaaagt gactgcataa actccccctc
38641 ttacagtacc caccatcact gtccaggtac atgtgtctcg ggtttccacc tctctgtccc
38701 acaccatatt ctctcgtacc caatcacagg gtggagtggc attcMggcag ccccaaatgt
38761 ctgaactcag ctggggagaa ggttgatggg ggagggatac cgggttcagg gcttcgtccc
38821 aaatcacatg tcacagcaaa agcgagttaga ggtatctata agacatgaag cagatctgct
38881 caaagatgac cacagaagtt tgtcaagatc agctgtcatt cactggcagg actcaggagc
38941 agacagctgg gttggccaag acagggagaw tggccacaacc agcaaggagg gccagggct
39001 atgagcatgt cacacggctg ctccctggagg gaggctgaga agctgtcatt agctcaggag
39061 tggcactcag ccatgaacga gtggtcattc ctggccctcg gtatggcaca gggggaggga
39121 gcatgcagag tggccaagac cagaggctca gcaaaacagt ccaagagtcca actccctatt
39181 ctgcaacctg cactcaatta ctataccttt ctaggccctt gtttccatat ctataaaaag
39241 gggatattct taggatctgc tccatgggat tgttaggagg attaaacaga ataatgcata
39301 ggtgtacttt agcagggtgt tgggcctata gaacatgtga ctataatgtca tttcttatta
39361 actgtacagt cactgccgta catctgggga aatgctacca ccagtcacat cctctaacat
39421 aaaaataatg gcagggttag actgtggtac agctaatgta tactcgctgt atataacgg
39481 aaattgttca cttacagaca ttacagcaa aaactctgag tctcttgat gacaactatt
39541 gacataaaact gtagaanaaa agcatctaat aaaaatgtcc aaagacccaa ttctgcacaa
39601 ggcacagcat gggaagtctc caggcgagtt ctccccctt ccatgcagg tctgcacag
39661 cacacgaac acaactcta ctcaatgtc tattcaaatg gcaatgaatt ctctctgtg
39721 gaccYtgagc aagttacttc tttgtgcctt aatttctcta cctgtgaaat aggaataata
39781 agaacagcac ctatttcata tggttgttat aaggataaaa caacttgata ttgtgaaagt
39841 tattagatca gtgcctggga tghtaataacc actttgtaaa tgtgtgaag aacataaaaa
39901 tcaattacta tggctcttgg aaggctatgg acttaataat gagaaaaatt gttaaaattc
39961 atcttgctc ataaagaatg ccaataaaag aaatgggcct tgtgtccaaa ttgtgggttg
40021 tgtttctcaa tcttagctct cttagtgtgt gcaaaaattg ctttaaaaam aaaaaaaa
40081 gccctggttt coactatatt tttagctcta agttatcatt ttttagctta aatattaact
40141 tagcgtgagt atctacaatg agacaaaact ctacagacaa acataagat ggcatttcta
40201 agagcatata atcaagtcaa taatatatag tatatagaca taattgtgta acacgttata
40261 cagaaaacta cccagtttat tctgtctgag gaagtggagc taactgtggt ctagttttta
40321 agctcatcta tcatccagg aaggacatcc tacagttata taccgtgagg tatcttata
40381 ctggagccac aatggtatct gacctccca actctctcac ctactcttgg gatcttttt
40441 cactgagaaa aatgaaggsg aggaactcaac acaaatggaa atgtttaagt caaactctc
40501 caagagcttc cagcttttct gtgaagaagt ttattctgct cccacacata tgtctggg
40561 gaagaaagag ctatggaact catataataa cattaaaagg taatgagag atacttcac
40621 tcccttaggt gacatccagg gtctctcagg ttgggtctcc ctcccccttc cagtccaag
40681 tcttgcaact taactgctct tcaaatccag cccatctccc tttttctctc ttgctctta
40741 tccctcactg tggaaatggt cctccaactc catctctaac ccccaaatct ccatgtgtt
40801 ctcaagagct attcaaacct caactctctc atgtgtaac ctccatgact atgtgtgga
40861 gatctaccc tctctatctc ataactcca gcccttccac atctgtgta acatgtgtg
40921 tatagacttt gcatctcttc ctattagaa aacaggactc ttgagtgctg taaccaagg

40981 cttcttctctc ctgcagcctc acagaattac tccacacata gtcaggacctc tgaataatgtc
 41041 ctttaagtaca cagtgatgaa aaaatccctc ctctgaaagg ccacataggg aacctcagaa
 41101 aggatcctgga ggaatgagga aaaagacatg gacatcacctc ttaattttgtc gcgggtctcc
 41161 cagtggggga ccaccagcat tctccaagcg caggcaggcc taaaggtcca gtaaacctca
 41221 tttaggaaaaa ggaactgtcat cactctactt ttagcatgtg cccctgaagg aaatcacttt
 41281 ttagaataat attgcacact gcttagggca tcttagggca tcttagggca tcttagggca
 41341 atcaataggc ttaatagcac catcacctgc tacaatgttt tcatccagat agtaaaaaag
 41401 atccaggggg gccacaagg tcttaggaca atgggtttaa tgttgggaaa taaaaaagga
 41461 atcacaccrrc gttcttcatg ctgtcttatt ttatttctca gaaactccaa gcaactttcca
 41521 ggcgaattca cctcaccac atctgtacta ttatttctac tttatttctc ttaataagga
 41581 caaagacatc cgtgaaagaa aacagagagg ggtggtgcc atgaattgac ttaatttctta
 41641 ccagggtgtg aaccacttag aacacalctc aggaggataa accagggagt cctaaggggc
 41701 tggaaaagatg gaatttttct gcaaaaagtc ttgattcact ttcatttcca gcttttgtgc
 41761 tgagaactcg caatcccccc ccaactccct gtcttataa caacatggc ttgttgtctt
 41821 ttttccactg tggtagacac actggcagac agggagcacag cccaacttgt cacttccag
 41881 gactactcgt tgccagctgg ctgccaaacc ctgccttggg attagaatca cggagagtgt
 41941 ccaactctttg taccaRcccc agtttagcctg gcccttctga ccatgtgagg ccaagtataa
 42001 caltcacatc caggaaagca aaaggatcac ctgcctgcc tggaaaWctg ccaactgtca
 42061 gcccaccaga aagcccagct ttagggagtg aggggctcac ctggccccta gacatggggc
 42121 tctctggcgt catcaggaga ctactgtgtt caatggaaaag attcagagtg accctctata
 42181 tagctggaaa ttatttcttt gaacccctaa tacatccaaa accaatttgt agtaaaaaag
 42241 agaaaaagag ggaattattat atttcaaggg aatgctcttR catltccaaa gttgaacctt
 42301 aataaattcac ttctacaggt ttgctgtgtt ttcttaatat ttatcgactat gatagatRtc
 42361 agaaatttgc aagcaggccc aactatcttc cagagatgtg aacactcagag aggaagagtg
 42421 aagaaataga gcttattcttt agttaagtgaa tttttcaaat cacttttgtt ctcaaggagg
 42481 gttactgtga gtttctatgat ctctgtagaa tgctttactt ttcaatttat gctaatttga
 42541 gggggggcaa taatttcata tccataaatt tccccaaaaa ttgatttctta ttttttcttt
 42601 aaactacttt ttacagttgg gaggcagaSt ggttaactcc atgcttgtgt atttttgttt
 42661 atcaggaaaaa gacttctgtga gtaatttttt ttctgttagc tataatcacc ttccacctac
 42721 cagttaatac attttattat aaaagataat aaacagtatc atactgaact gaaccaccaga
 42781 cttaacagctg gtgaaactgt taacacagta cgtcaagatg tactgttgtc gggggagtgt
 42841 tctcatattac accaagtggc aaaaaagtcct ctgcacaaa ggaactccat gaaccccaa
 42901 gcatcgagaa ggtgcagcca gtggagcaca attgtgctct cgggtgtctc ccacactcgc
 42961 agtatgttca ggtgggaaaag agaactgtag caccaggctg ccgtgctgag gctgagaag
 43021 aaaaactcca agtcaaggac cctgagcaca tgcggaagac tgggacagca gcgRagctcc
 43081 tgagcgaaac agtggaacacc ttgtctcctg ccagatggca ggggtgtacc acaccctggg
 43141 ctccccacag gggattcaga tacggccagc agagtctctc ctgggcagaa ctgttcagat
 43201 ggccagcagg gctgggtgct ggttagggag gaggggagcc cattgttaag accactgca
 43261 gtgctcctgag ggtcactggc tgcaagggca aacaaaatc tgacctccat gggggcgagg
 43321 ctggggctgc cctgcagatc ctctctctgt ttccagagtc ttacagagtc gatgatRta
 43381 aggcctNaaa aaMctttttt ttagtataaa atatttgtgt gtacatagtgt gtagtatRta
 43441 tttatagttc acatgagata cttgatataa ggaatgcaac gtgaaatgat tatatcagat
 43501 taaaataggct atccatcacc tcaagcattt atccttttgt ttacaaaaca tccaacttac
 43561 tcttttagtt attttaaaaa tgaatatatt ttttactact agtcactcctg ttgtgctagc
 43621 aaataactrag tcttattcat tcttctcacc tattttttgt atccatlaac catctccact
 43681 tccccctcac tccccccacc ccccatcacc ttttttaact ttctgataacc atctctccac
 43741 tctctctgtc cttaggttca gttctttagt ttttttaact ctacaaaatR gtaggaacat
 43801 gtttaagtgt tctttctgtg cctgggttat ttcaacttaac ataatgagag gaggacctgt
 43861 calacatgaa ccaggaggct ctatcatgac aatcagtcac atctctggca tacagggtaa
 43921 gaaaaaagga ggtaaagattc gtgctctatt agacttatt ctatttcaat gctctctaa
 43981 ttacaggaga gctgaaggc ctctcctagg aagtaaaaat aaacagacat atttgtttt
 44041 cttaaatcca gagtgaaggt catgcctgtt ccagagatg aaacaaatc ctcaaatctc
 44101 agcttcaaat aagtRgagta ccacagatgt aaactgtgca ggtgactttt atcttgtgt
 44161 aagaaataca ctttttaaaa aggaagcaaca ttctgttaag ctaattaaag gctgtaagat
 44221 ttctctttct cccctgttaa cttaatagac gttttctcca tttcttcaa aatgttatt
 44281 tttttattat gtttaacctc ctggccaact gcttttagca gtaattaaaa gactacagga
 44341 gtttaaaatt taattagatt gtacaaattt tgaagaatgg gaattgtgaa ggttttaagt
 44401 gctttttttt tctgggaaaag aattcttttc ctgtctttgc ttattatata ctaagatttt
 44461 tttaattgtg gaaactgag ttgaaattga agctttctga acaataatc taaggagtatg
 44521 ctttggcttg tgaccRaat gtttctctta atacactcag cccagcactc gaaggaactca
 44581 ggcaagcgtc acaaaattag ggcaaatgct gagggtgaag tagctttagt gtctctgtga
 44641 tgaggtctac gttgcccaa gacgacgttc tcagagcagt cctaactac tgcctgtgac
 44701 catcaggggc gtgagctcta cagcgccaaa ggtgtgtgtg gaggagcaca gggaggagca
 44761 aagtcccgca gctcttctc gctcacaagg aagaagatac atgttagagg aagaagtgaa

44821 tgaaccagg agaagagtg ggcaggatt caggctggca gccatgcaac agctcagaga
44881 ataaccatc caggatgaag ctggaggagc gcaggctctg taaggaaagt ctctgggaaa
44941 aatgggacac agaaactggga gaaaggatat aaggacagaa aagacaacga taaggaaaaa
45001 ggaagggcaac tagaaatgcc cgtaaacaac taagaagcga tgggttcaaat
45061 agaggggcaac cactcagaga cttgaagaaa aaatgaaatg ggtttaccct aaagacagca
45121 ataggaagaa agcctgaaga tccacaggat atggtgaata agatgtgtcc caacaacaga
45181 aggcatacga acaacttttag gggaaaaaag agagtcaagg cataaagttaa accgtggcat
45241 gctttttcgt ttgtatatga aagaagaatc cacttgaact tgaattttgt accactctcc
45301 cttgacagca acgaagatca tgacatttga aacagaataa aatgtaagca ctgtcccacta
45361 cttgtttcta cgtaaagcac aataactcta acattgttta ttgtctctag actttgtgaa
45421 acaattcata gacaaaggct aattgcagtt ataaaaagga acataatact tgaccgtttc
45481 aaagtaagag acccaacaac gtttgaaggt agaaggggaa gaataagaaa gtaggatgc
45541 taatgtctcc accttttaaa acattttatt tttttgagca gggcttccact ctgtgcccag
45601 gctggaaatgc agtgtcgtga tcttgactca ctgcaacctc aKctccctcc ggctcagggtg
45661 tcttcagcctc cttgagtaac tgggattaca ggcacaggca ggcacatcat cctgtactatt
45721 tttttgattt ttgtgagaga cagagttttg tcatgtctgc tgggtgggtc ttgaactctt
45781 gggcttgaag gatttggccc ccttggccctc ccaaagtgcg gggactatag aggtgagcca
45841 ctggggccag cccttaagt cctcacctttt aaaaattagt gcagcaaaaa gaataagaaa
45901 gatattagtg tattgtttaa tgttacaaga ttaacaataa aagaacaaaa acactagtac
45961 ttcatcatat tgagcagaaa gtggagggga agttagaagt gaactatcta cgtagtgtgc
46021 tagataaagg ttactaaagt cccctagagt tggtagaagg gtatgcactt gcctataatc
46081 ccagtcactt gggaggccaa gacggacaga tcaactgagc ccaggaaatt gacaccagcc
46141 tggacaatat agcaagacgt ggtctctaca aaaaaacaaa aaattagcca gccatgggtg
46201 cacacacctt tactccagc tactcagaag gctgaggcgg gaggacatct tggagccttgg
46261 agggcgggag acatcttgag cctgggaggc ggaagatgcg gcagcgtgtg atcatgccac
46321 tgcactctag cctggatgac agagtggagc cctttctcaa aaaaaaaaaa caaaaaaagt
46381 taagtgtata aagcaataaa taacggcaca tcatgtggca ctgtgggttaa cactcttttc
46441 aaagtactgt ttcttggga gcaggactaa aattagcttg tatataactg ataattttaa
46501 ttttctatgt aaggtttttt aaccatgtga tatctatgta tattaaactg taattttaa
46561 caattttgac taacagacta aaaaatgata actgtataaa atacctcag tgaagatttt
46621 acaggtaaRa aaatgctgtg tgaggacaga gggcccccctc tggggcgag agcagaggtac
46681 tggcatgaga gacacagacc tctactggct gggggagaca ttgtcataat ctcaagccta
46741 aaaaaggaaa atgaaacacc caccctgtag ggtggtgtg aggatataat gagaacctgg
46801 ctctaaagtgc tcaggatgtg tcaagctgcta cagcagtagc tgaatactcc caacaagttt
46861 atgtctcact tgactctccc aaactacact ttactcatct ataaaatgag ggtattgctt
46921 tctctagcca tcttggtagg tctgagaatt gttcagact atctcccaag aacctgctgc
46981 ctaatcacac atcttcttact ctctctgtac aattcagtga aagcttattg ttgttaagtc
47041 tatggtgtct cacaacggga atgaaacaca aattgagctg aacagattat ttcatgaac
47101 cagcctcgaa actaagaatg ctataatggc ttttgcgtc ttccacagta aataaatact
47161 gaagagaacc aagagaaact cattagtttc tctcagacat actgttagtc ttccagata
47221 cgaagctaac taaattttt taaaactagg tcatatgata ttagtaggct tgcacacaa
47281 gcattttttt ttcttttaga cagggtctca cgctttcacc cctgtgtggag ttgtgtggca
47341 agaccatggc tcaactgagc ctatgtctcc caggcctaaag tggctctctt agcctcagct
47401 cccaagtggc tgggaccaca ggcgcagacc atcacctcca gatcaataaa accaattttt
47461 tgttagagag ggggtctcgt atgttgccca ggctctctt gaactcctgg ggtcMagaga
47521 tctctccgcc ttggcctccc aaagtctggt gattataggt gtaagccagt gtacctggcc
47581 agtgtagtac tgtcttgaca ctaataacaa gattataggt tacaagaatc ttataagaaa
47641 acatctctcc aagaactcca cagcattttt aaaaaacaca taattattat ttcatgaaa
47701 aagacacggt taaactaac aagctttttt aaagatgagt tccaactgat tcaattgct
47761 acatctgctt gtgattttaa aaaaaaaccc aaatgtaggt ttaattaaac ttcatgaact
47821 aaaaacagct tctgtaacat tcaaggaaac atatgtcttc ctgttaccat agcaatgcct
47881 gacgtggcga gcaactacta gtgtaggaat tggcaatata atccatctgt atcaacagct
47941 atgtttttta catgaaggga gctaagaagg agagaagatg cacaagaagt caacaaggt
48001 cgtgttcagca gcaacacctt ggtccaggag ccaagagaag aaagctttcc taacaacct
48061 ggcactaaac cgttctcaca cctctcacac atcttgtccc tctctctctt cctactctgc
48121 tatattccat gtttgcaaac atgaaaacca gtaaatgaag gttaaggtgaa gtgaagagt
48181 taatgaact gaattatgaa ctactgaata aacagagaga atgacttttt ctgagctgt
48241 ctcatgact cactttcttc ccacaatttg gagtgggaat gagtgggaat gtggaaaggt
48301 agtagagacc ttgtctggga tttagcatYg tgtggcatgt ataaagcag atgacacact
48361 gagaatggc agcagcagca attccattaa aacaggtcac ttaatttccc tccaactttt
48421 tctgtccgta ttctgttttc actgaacatt tggctgtgaa aatttatgaa tatatttgc
48481 gcttactcga ttgagatctt taagttagtg cctttaccag agacttcaac actctcaca
48541 cccaactacc ggcagatgag aaagacaaga accacataat caccacagat gggatgagc
48601 ggcacaaatt ccagaagtg ggaatttcta cagctttctc actcaagatg tagttcacag

48661 accagccacac ctggtatcac ctgggacgtg gttagacctg tggactccca gacccccacc
48721 ccagcctgct acatcaggat ctttaataag atctccaggg gattcatagt cacatttaag
48781 aatcctgtgt tctacaggac aaacccaaaa accaaaaaaa aaacataatgc agaaacacac
48841 accagagacg agagagacag aSagagatgg aaagggaacc ctgaggttga tggtgctga
48901 cgcgatgtRca catgctgttc agatcgtgat tcgaaaaata attataaata tctgatatga
48961 tgttaagtgt taaatcgacc tagatttggg ttaattgaata ggttgagcaaa tggtaaaaag
49021 tttaaagtaa tacataaRgt atatttaatt tggataggag tgacactgct tgtaattctN
49081 aaatgactaa acaataaagct aaatgacact ggagattatc attgataatc ttcacacatt
49141 cctaagttag accctagtaa tccagtgata agaataaggc aaaaatttta attgaagtga
49201 attacattga ccaactatg aaaaactatc tgcagacta cttgatocaa aggaaggaat
49261 caggagatga caggtttccc cagaaaaagta ggtgggagtt gagaaaaagt ggcttggggc
49321 aagtcatcac ctctcacca actctagggt gactcatctg caaaggagca aataataaca
49381 gctcctgtgc ctagctcaca tagctgtcgg ttcaaatgca agaacagatg tgaaggtgac
49441 ctgtatatgg aaaaacacta gtcaactgtt acttgcatt aaaaaaacac agaggttaac
49501 tggcttcaaa gcatgagctt ttgtttttct tttctttttt ttttgataca ggctctcact
49561 tatcaccagg gcttccgtgc agtggcctca tcatggctca ctgcaacctt gacttcccgc
49621 gctcaagcaa tccctcaccc tcagctctccc aagtagatgt gaccacaggc atgtatcccc
49681 atgcctggat aattttttta atttttttga gagatggggt cttattatgt tgcocaggct
49741 ggtcttgaac tccctgggctc aagcgtacct ccagcttcaa cctcccaaaag tgctgagatt
49801 acaggttggg ggcactgtgc ctggccaaagc atgagctctg gaatcagata ggatccctag
49861 gtttgtatca cagaaccagc ccccatggaa gagggggcaa tgaataagca tctcatattc
49921 ccaatttctc catctataaa atgacctaac acccgctgtg tgagactgtg ttacagttca
49981 gctttccacc tgctgtttct cactaggccc ttcttgagca gtccctgcag aagggttaaa
50041 tgatctatcc attgatgtg gttctggcaa gtgactctg tggcccaggc agactcatg
50101 gaagtgttat ttgctccttt agagcaggag ctttaacagc cagccatctt gtgaactctg
50161 cagcagctgtc ttcttctgc agttacaatg gcagtgacc agaWggagac tgactctatg
50221 cctgagcccc aagagtaggg aagtgcagca cccgaccttc atgtgagctt tgaattaatc
50281 ctctcaaaaag ttactatgca ggccagggtg agtggctcac gctgaaact cagcaccgc
50341 agggcgggtg gatcctcctg cctcagccta ttgagtatgt agaactacag cctgtgacca
50401 cgaYgctgtgc cattttttt tttttNatag gtgactctg tggcccaggc caggtgttta
50461 aggctgcagt gatctgtaa ttgtaccaatg tactcagctg tgggtgacaa agtgagacca
50521 actcccatct Ycccgcacac acacacacac aaaaaaaaac aaaaaaaaac aaaaaaaaac
50581 aaaaaaaaac agggagattaa attctgtat gaaggtgat ctcccaaaat attaaaagga
50641 aaaaacacatg ctctatcata aggacaagat gtcgaggcag agagaaattct gtacaagcct
50701 ttattaaaaa aactcgtctt taagtctctc aacacaattt agttgccttt tcataaacta
50761 ctattctttg tccaaltcac tataaactgt ttaattgctt ctttagtctt tcattttctt
50821 acaaaagctt ctgtgccatR taaaacctgt atgagctttt aacacaaact catacaactt
50881 gtattaaatt tgtatccttt tctctgttta atctatctta tgcataatta attctcaggt
50941 ccagccaaaa aacaacccca aaaRggaaga Rgtaaagttt ttcttttctt acacaccaat
51001 tataggcct tgtaaattcc agcctctcct gactatgcaa tacttaaaat cccataatata
51061 atttatctaa aggcatacaa agttacaaat cattatcata aagaattgtt gaatgtgttt
51121 gctcttttta aagtttaatt tggtttaaaa tacaattgga aatatagata ttctttaaatt
51181 catgcaatgg aagaatgtct gcctttttgc tatttcatat gaatttgttc aaagttttta
51241 taccatctg ctctagaata tcttaaaagt atttaattct taatttagtt ttcttcaatt
51301 tacttactaa tttcaacat ctgggttatt tgtgttact aaaaattgtt gaacaaactt
51361 aacacatgaga gaatacYgg aaaaatgtgcc tcttgaggc cgtgtgactg agctagctca
51421 caaggggtgt gagtgatctc ctctatcttt gggaataatc catttctcag tcaactttta
51481 actcacgcga ctcatactga gataaccagc cagcagcaga acaccagca accagaaagt
51541 taccatttag taaaacattt ctgggtctag gctttcactc taactaaagt catgaagaat
51601 acaaaagcaa atggcaacaa aaacaaacaa aacaaaccaa aaaaactgga accatgtgga
51661 cctctagatgt attctgttga gccactattt ttatttttgc agacggagtc tgcctgtgtc
51721 gccaggcgtg gagtgcagt gcgtgatctc aactcactgc aagctccgcc tcccaggctc
51781 acgccattct cctgcctcag cctcccgagt agccaggact acaggcgctt gccaccaagc
51841 ccggtcaatt tttttgtat ttttagtaga gacgggtttt caccgtatga gtcaggatgt
51901 ccttgatctc ctgacctcgt gatccggccg cctcagcctc ccaaggtgct gatctgccg
51961 cctcagcctc ccaaagtgtc gggattacag gcgtaaagca ccagccccag cactgagcc
52021 actatttaag caaagtatat ggcaaaacca gtgaacaaat tcaatttctg aaacgaaat
52081 aatagttcta aagttggctt ttatgctata tgcaatatgg gggaattctg atcagaaatt
52141 tgattgtttt tatgtttacc tttagttgc ctttcaataa gttacctgca aagttatttt
52201 tctaactcaa gtgtcattt gtctatgtcc atcagaacct atcagaacct ggaagtatg
52261 tcaatttttg gataacttac gaagagagga catgctggag gtaccgccga gaaactgtgt
52321 caagcgcgtc tcaactgtcc tggagctggc ctatctttca ctaactgagat
52381 ctgtgtcaga aggtcagact gatgttccag ctttttgctt tctcaaaaag caaagtttta
52441 agctttctga gaattatggg agttgaatca tacttccat ttaagcagca tgaacttttc

52501 ctgaaataac gttagtgcac ttaaaaaaaa gaatacctga tacatattag gtggccaata
52561 aacataaagc atgattttta ttat tagcta ttactataaa taatataatA aaaaataaata
52621 atactattga gctcattttat aataagctaa ataataaact gaaataagca ccaagcttaat
52681 ttgataaagc gtccagataaa gatgattttg aaagggcaca taactactaat gtgactggag
52741 taacagatcat tatcacagaaa acgacgtttt taaaaattct ctcttgtaat cattttaaatt
52801 tcttttctraa aagatcacggg aaaattaaaga tcaaaattgca aattgtctgaa gctgtatgca
52861 gctctctcacc tctcttttca ctcttctgcgc tgacctgaag atagccaaga ctggaagaca
52921 gcaggggttca aaggccaact tctgtatcgc tgggggtctgt cagccctttct ctgtctgcaa
52981 accttccagct gcctgtctct ccttaactta ctccactctc caccocctct tactctctta
53041 ccatcttctct taaaatgcct ttgatgaaga ggggtcctta tcaaccaaaa tctagtctcc
53101 tgacaattgt agactcctta ctaagttaaca gcaaatctaa tcaattacaaa atactttctc
53161 ctctcaaatg tacaagtatc cccagttacat ttaacatatg gctagttaact aaaaattcag
53221 gaaaacatac ttcataaagt gaaatatacc tcatatacat atttatttaa caaaaataac
53281 tcagagaaca ctacttttat catttaaggt gggatcattc aatgagttaga gcttatttgt
53341 gatgtctttt ccaataaagt acctaagaat ttcatacaag aaaggttctgt atcccaagaa
53401 gtatgttaat ctcttctctg accagcataa aaactctgag ttactctctg caataatttgt
53461 gacctgccaa agaaaaaagc atgcaaaaga taaagtacat ctatgtatat gaattatgac
53521 tatagtgtat gagaaaaacta ggaatgattt agtggacatt acatagcaaa ttatrtgtca
53581 aattataaaa aaaaggagac tcaatgcaca caagcttcta cagctataaaa attatgtttt
53641 ttaaaaaagg aattctgcaga ctataataaa gcaaaattct ttgtgttctc ttgtgtttgt
53701 ttttctgagg tctgtgtgaca gaagaatggc cactgtattg ataccgtctgc tggagcatgt
53761 attccaactg ggaatgcaact ggacatatga ctacatgaa atatttctta accccctgtc
53821 cattacaagt aagttcaaaa atacagcttc aagcagatga actaagattc atggagcaag
53881 ttgtgaaga ccttctgcgc atccaWctct gcaaatatac taactaaactg aaaaaactc
53941 caagggccct Nggctgttgc tgatgaatac ggctgtgtgag ggctcctctg tcatatgggt
54001 tctctgagtg tcaactttca aggttagatc cagggtagcc catgttagat attccaagac
54061 atccccaaat tagctcagag ctggaataca taccoccttt ccttctagat Kgtatgtagg
54121 aaagcagaaa gttactataa ctgcacgaMa cagagctcaa agatcctca aataaatccc
54181 ttgtccagag tgagggggcca tgcctctacc attcagtgcc aggaagccct ttctccctag
54241 ttaacacttc catcagtttaa cacaaactga agcttcaata ttgcttcaat cctatcatc
54301 aatccaagct catcagctga cacatctgcc ttttccaag actgtggaagg cagggatgtg
54361 gtatctctcac gtctgtctga atgctgact tccaacatgg agtgtgtctt caatgacac
54421 tttgtatga aggacttaag caaatgaaca cacaacatgg caaaacccctg cctctataaa
54481 acatcacaaa attagatgga catggtggca tgtgctgtga tgcacccctg ctctggaggc
54541 tgaggtggga ggaatcacct agcccaagaa ggtcgaggtt gcagcgagcc atgatcacac
54601 cactacactc gatcatacag tggcagcagg agacccttgg gtgcaaaagg aaccaatgtc
54661 tctcaaaaac aaaaacaaaa caaatgaaca caaatcccg agtaggcaaa aaccaatgtc
54721 cattaaactg acatccagtc ctatctgagc ctccagagcaa atgttttctaa agaagctcca
54781 tcccccttgt cacaaaagta aacacatttc agaggacaa gggataatgta catctacca
54841 gacagaaaat gaaaaaccca gcttgtctcc ttacttcaac aagctgaaat gtgattgtgt
54901 gcaaatgaag aatgtctggc tactttaaaa agtgggtgca acattcctag gaaataaagc
54961 ttgtgttat ttattatac aaaagtagga atttccaaaa ccaaacctgt ttgtttttat
55021 gaaagtcatc agcatctaa acttgatgaa acactaaatt tcaattctat ttctgataat
55081 tactatgca gtactttat gctagatact ctccaagga tgaagttaca atggtaacata
55141 agaaagacaa gatgcttgcc ccargaagct tacattctag tggagaagga tgaataataa
55201 taaagtataa tgacaatttc aggtggcagt aagatgtttt acactatga acaggggaa
55261 agtggctcag aatgactggg ggtgacaata gcacataatg ccaactcact ttgtatgtta
55321 cttttaactc taaaggtgct ttcatatcta tcatgttaagt ggaatcccaa aaatccgttt
55381 aaaaataagc aagtaataat ctccccatt ttctagatgc caaatgagaa gggccaaaaa
55441 actcacaac acataatatt tagtggtaga gtggctctac aaaaacacaca aaatattgac
55501 ggcatcactg gcatgtgcct acagctccag ctactrggga ggctaaagat ggccgatcac
55561 ttSagggcag gagctcgaga ccagcctggg ccaacatggt gaaacccctgt cctactaaca
55621 agaaaaaaa ttagctgggt atggtggcag gcgctgtgaa tccagactat ctaggaggtc
55681 agggcacaag aatcccttga acctgggagg cagaggttgc agtgaagcga agtgcgtgcg
55741 ctgcactctc gctcgggtta cagagtgaaga ctccctctca aaaaaaaa aaaaaaaa
55801 tagtggtaaa gtgagcact ttgactttca gcccaaatct atttccac atgtctcaaa
55861 tctaccacat acaccaata ctcatcaata ccatttcata gaaagtatt ctgctagtat
55921 actcaaggt ttgctgtgca gtccatcaag agccctctcat acagagacaa ctgtgaaca
55981 tgccatgaag cctacattYt agtggaggag cgtctctaata aagaaagttag atcaaaaaa
56041 tggcagaagt tacaaggaaga ggagataaag caaactgacc ctggggagt cccacagacg
56101 gtatgaggtg ggtgcataaa tggaaagcga ctgaaaaata tctcgtgagt aataacagaa
56161 aagttagcat ggtgtcctca tgaggggccca gccatgcacc taagtgtcta agcaggttag
56221 gactgatgtt ccttcgttgt ccaaaagatg caccaggacg tctggaagaa agtgggtgac
56281 ggagttataa gaggagatg aaatcatcta taagataa aataattat

```

56341 ataaggctgt taacttttct tcagccatct gaattacctc aagtttcac tggagcaatg
56401 aaacttttcc aatgacactg taattttcct agcaaatcca cttttttatt atgtgttaaa
56461 aattactttc gacctgttta agttattatt gaataataaa taatagattt caaataataa
56521 ccgtctacta ttcatatgta gtaacttaca gcccataaaa acaatggatt tggccggccg
56581 gcggtgtctc acgcctgttaa tcccgacact ttggggagcc ggagccggcg gataccagag
56641 tccaggatgc gagaccatcc cggtctaaaac ggtgaacccc gctctctact gaaatacaaa
56701 aaaattagcc gggcgtagtg gcggcgccct gtatgccag ctacttggga ggcttggaga
56761 gaagaatgoc gtgaacccgg gagcgaggag ttgcagtgag ccgagatccc gcaactgac
56821 tccagctgtc cgacagagcg agactccgtc tcaaaaaaaa aaaaaaaaaa aaaaaaaaaa
56881 aaaaaaaaaa aaaaaaacat ggatttgggt ggaagccagt agttagatgt ctgactgatt
56941 tcattttact tgattccctaa tgtttcattt ctaccaaaat gacagtttat ttaagtattt
57001 cctgttcaca cagctcaagca aagtgatttt ttatgagaa tatcttctact agcaataata
57061 gaatttttaa agtttccata aaataaattt acttcttatt aggcatttca gtatgtctat
57121 ccttgagctc ttgtgaagaa ttttactgaa gaaataaaag caaatccgca acagaaatac
57181 ataaaaggac acttttcagg tcgagaatta gactaagcat ttgcaaacag gtttgcgctg
57241 attaccacaa ggtactggat cagttcctcc cttagattc caaaccaatt ctacagcctg
57301 tcataaagag aagcacactg gctccaccgt aggaacacaa ggtctctgag ggatctgcga
57361 catgtgctag aatcagaaac cgcagtgtag caataggact gctgactgt cctaaggaaa
57421 taattttaata ctttttgcat gcatcatalc gcatttccata taccacaaac taaataatcc
57481 tagaagtggt ctattccaact gatgcttatt gagtcttccc aagcactaaa ataacagaaa
57541 ttcaaaaagt gcagaggaaa ttgtttcaca gctccaccaa aaattattact taataattaa
57601 ataatgtttt ttttcaatc cattaaaaact tagtgttcat tctttttaca agagactgga
57661 catatgcctg caagacatcc ctctccctct gaagtcaata aaactttgat ttttgggctt
57721 tgcaacacaa ggaatgcta ttggctatgg gaaggcgca gcaatgagata gaattacaata
57781 gaaaagctgt caaacagtaa agctcactta atataaaaaa tctacataaa caaacagaaa
57841 ccaaacacaa cactactttt actttttttt ttttttttga gatggagctt gaactgtgtg
57901 cccagctgtc agtcaggggg ttgtatctcg gctcactgca accctccgct ccagagtcca
57961 agtgattctc tccagcctca gccctcctgag tagtctggat tataggacc ttgcaccatg
58021 ctcagctaat ttttgtattt ttagtgagca ccaggtttca ccatgtggc aggcctgtgt
58081 tcaaacctcc gacctcaggt gatccaccgc cctcagcctc ccaagtgctt gggattacag
58141 tctgtggggcg ccgcgccctg cctactttca tcttttga taataactact caagtattcta
58201 tgatagttta taaacagcaa ctctgggcta taagtaccaa atcactataa agactacatg
58261 gatacaaaac tgtaagttca gaatctgttt tctcagctct atcactatgc ttattatcat
58321 gataattact acataattac ctgagcaaca cctctatgc aatctcaagg gagactcatt
58381 gagtccaact gccctctctt tctcctttt catcStactg tacaattcat gagcacctgt
58441 accacagaac gaatttaaag aaagagaaac tcaaggaaag tagatctcca tcgaacatgt
58501 ttaactggtc agagttaggg aaagatgagc tttagcagga aaaagtgtag ggggtggaga
58561 gccgtgatgc tgatgatcaa gcgtcctctg ccactgacac aggtagttag aagttggctc
58621 tgggagaatg tgacattttt catttgggaa ctcttgagga taagtggcaa tatacatct
58681 cctacacaga tgtgtaacag ctatttatata cctctgagga tctgccacaa ggaacatttt
58741 gtaaaccaat aaagtacagt ctctcccaag ggcttactct ggtggctcca gctatacagc
58801 acacaggctt catgatgcta gttttaatct actggccaat caggaaatcc caacagagca
58861 tctatgcaga gaaaagctga ctggcattag gaaaagctga acacatttcc ttcatccagc
58921 ttatggcata taaaattttg ctcatgtttt tggaaacttt Staattaccg gaaataatc
58981 tcaactacca aaatccaatc cctagtcccc aagaagaaag agaatcttag ctagtggtag
59041 gaattctctt ttgttgact taattataaa tacaactgta agtccagaaa agatagtata
59101 tttagtattc tggcctcttg ggaaccactt gattctggaa acaagagcag tccaattccc
59161 accccatcct caaatccag tctcttcagg atttatgag atgtattca cacaacacaa
59221 cctgtacta taacacagaga aatacagcca aaagtataat gttgggcttt ggaagagaa
59281 actgtaaaaa ggtcacagca aagaaggaga gaagagaat gcggccctgc agctttgtag
59341 cctgcggtag ttaagataa actaagaaca taactctcac atcaagctg accctacaa
59401 caaggtaga gtgtaagac aggaagccag acacagcat t agctgtctcc tctgtctatg
59461 taagtccagc cagcttggga agaattgtgc ataacagtag atctatatgc aaccttttag
59521 taagtgcaca taactaaca gctgcatgat taactagccc aggtattcac gaagggctgg
59581 agcagggcag gattgaaacc accgtaaatg ataaaaacta aactgtatgt gaaaagtgt
59641 tcttttactt ccaattttgt ggcataccaa attgtataac actctaaaat ctgaacttaa
59701 aataagattc tgtcatcaag aaacactaac attccttctc cctccagta gtaaatgctt
59761 cctgttttcc atttcttacc faaatagatt ttaactcttg taectcttg acccaagca atcccatct
59821 caggatatta ccttactgct gttaatccag aggctgagac taaggaaac tctcaccat
59881 ttatttttctt ggttaatttc ctccacataa caaggtgaat gaataacata gaagggctgg
59941 acacttacag aaagaatcag aacagtgtea cataatggag caatttgggt tttgttgtt
60001 ttgtttttt tttagacgg agtcttgctc ttgttgcag gtttgagtc agtggcgtag
60061 tcttgctca ctgcaagctc gcctccagc gcttcagca ttctcctgc taagcctccc
60121 gagtactgct gactacaggt gccccacc acgcccagct aatttggttg attttttgca

```

60181 gagacggggt ttcacatgt taaccaggat ggtctcgatc tctgaacctc gtagctgccc
60241 tgcctcagcc tcccaaaatt acaggtgtga gccaccgtgc ccggtcgggag caatttggtt
60301 taacacacaaa ggaatcacac taagttagtcc atgtttcaat tatgtccatt acgaaagatt
60361 tgcgttcttcc cccctaaaca tattcattaa gtaaaaagag tttagtgatt accctttcatt
60421 cataagaattt aacaaaataa attcccYaag gcaaaagccag tttcttggtt tctctcaata
60481 atgttcaattt acttgggttta agaacactga ttatctacag tccacatttt cctttcgcgt
60541 aataaagcat aagatgtttt ctatagaaaa aattataaaa attcaataaa gccaaaaata
60601 attcaaaaag caaacacagt ctagaataaa cattatgaca aaattagaat atattctttct
60661 ataactatttt ctgtacatat atacagtatt ttttaggcca ggctgtgggg ctacgtccgt
60721 taattccagc acttggggag gccgaggcag gcagatcatg agtgaagaag atttgagacca
60781 tccctggctaa catggtgaaa ccccggtgtc actaaaaata caaaaaatta gccgggggtg
60841 gtggcagcca cctgtagtcc cagctactca ggaggttgag cgaagaagat ggctgtaacc
60901 tgggaggcgg agcttgcagt gagccgagat tgcaccactg cactccagcc tggggcagac
60961 tgcagaactc gtrctcaaac aaaaaaaaaa aaaaaaaaaa aaagagacaa tctatatatt
61021 gccctatggt aactgttttt tcccccaat aattcatagc agtgtttcta ttaatatctt
61081 ttggtttgtt aatgagatgc aaactagttt caatctcctt aaaaatcatg tgaaaacata
61141 cctggaattt ttcacctttg tgcattctag ttgatctaaa ttcaggagaa tctataaagg
61201 cacaggggta aatgtttatgc agaaaaatgc ctgtagtaga gaccttctt ctgataacag
61261 aaatttaattg taataaaaagc aatatttccac aaataccatt ataactctta aaactgctat
61321 cactcttagc gtttttattt tgtagtacag tttaaaaaa tttcaacaga tccagagatg
61381 aactaaaaagc acttcttgag gcacaaagtat ttcaaaaaa atcgtttagaa aaagaaaaaa
61441 acaggtgtcca gatttaggcc agaggttagt tctctagtgg ttaacttagc tctcttaaca
61501 gaagttagcca tataatctgt aactctatRct ggcacacttc tgagagggaa agaggtgtta
61561 ttaataacaa tgcacagaca acagagactg actctctccc caaagagctt atttctcgat
61621 aagttttattt tttgtgatat tcaagacaaa ttaactctgg agcatgcata agctttttga
61681 atttcaatgt ctaattttaa tccactacaa ttttgactca tatttttaa aaacgctcaa
61741 aaatgggttaa aatccttgca attgaaatcc tgacatcaag attcagagaca gtaacttcaa
61801 cctgggtttta acatgttgct ctatagcatt gtaaaagata gttgtagcaa aaattccac
61861 caacacacaaa cctgtgact gctttctcca ttcattggca acatttcttc ccaattcaact
61921 ccttcccgaga gcccatgaaa agatttaaagg taaactagga attttgattt ccacagaaa
61981 cttaactttcc cttcaagaga atactcagac ggctcatcaac tgaggtttta tctcttgacg
62041 cataagtttgc gccctttttc aaggtttgga tcatgcaaaa ctgtccagtt ctctcttgga
62101 accaaactgg aggcacacgg agtggttcaa acaatcgccR gacatgccca ctgagttctc
62161 tttcaatctt tacctgaaat gcagcaatga ctagatgctt gccaatgca cagcaactcc
62221 caaaacactg acttctgtgg tctaaatatg gttttgataa ttaacaatac tttgatata
62281 accataccct tctgtattt aggcacaaatg aatctttacac agcaagtga atggtgatag
62341 aagtttatc ttcagatgct aaaagggtat ggtaggtgca tgtgaggtgg ttcacgtcgt
62401 taattctggc actttggggag gctgaggtgg gaggagcact tgagcccaag agtttgagag
62461 Yagcctgggt aacacagtg ggtctatct ctaattaaaa agaaaaaggat caggtgctggt
62521 ggtcacgcct gtaatccagc cactttcagt ggtcacgcct gtaatccagc caacttggaa
62581 ggccgagggc ggtggatctt ctgaggtcag gagtctgaga ccagcctgag caacatggtg
62641 aaaaacccat cctactaaa agtacaagaa attagctggg ctggtggcca tgcacctgtg
62701 attcagctca ctgaggaggg tgaggctggt gaattgcttg aaccggggag gtggaggttg
62761 cagtgaagct agattgctcc attgcaactc agcttgggca caaagagcga aactcgggtg
62821 caaaaaaaa taaaaataa aataaaaaaa agaaaaaaa aaagaaaaaa aaagaaaaaa
62881 aaaaaagaaa aaaaatagta cctatagctc tgggtacttg ggagctgag gtggggagat
62941 tacttgagcc cagaagtttg agactgcagt gaactatgat cgaccattgt cactccagcc
63001 tgggcaacag gtaaacactg tctcaaaaaa tcaacaacat ataacctctt catcttccca
63061 ctgaactcag agcataaagg gaagatccgc actatttcat tcaacaacat catcttccca
63121 ataatgcac ttgtttagggt ttaaatgttg tcaacaacat gtttcaacaa caaaaaata
63181 ctctataaaa taacagaaaa ccttttctgt gaaacctttt attagggaa ctaactgca
63241 ttaactaatt ttaaatatgg cagcaagaaa ataaacaaa ccaatgaaat acttaatgca
63301 caaatttaca aaggttaaac atacattaag tgcacagctg caatcactgc atctatgca
63361 caaataatga aaaaacaaa tgcacagctg atcagagctt atcagagaa atcattgca
63421 agtaaaatga agggaaaaaa aaaggggtga aaagagtttt ccaatgaaat ttaactgca
63481 agctaaaaat aactctgtaa aatgggaac ttgtgtcaga tttctccaaag ctaactggta
63541 aagagaaaaa caaaatggct taactatttc attagctctc atcagagaa gatcatgca
63601 gccacatttt tgggcccagc attagctctc ggcaggcact atacgaagcc tactgtctct
63661 ccatactgca ctgtatctct tatagcattt gcaagtgtcc atttaagta atttayata tgagagaaa
63721 gtgtctccaa ccaatgtcac catatttttc aaaaaagtag ttgtgtgcta tgacatac
63781 ttttgagaaa atccagcatt catatttttc aaaaaagtag ttgtgtgcta tgacatac
63841 caaaagcaca gacactaagg gatttaacta ctgacattca gaaatagcaa tcatatttca
63901 gaaccttaca ttttggggtt ccagcaagtt tatataatg catttattca tgaactgctc
63961 cctctcttcc tccaaagctc

64021 atcccgtaac tctcagatca agcccttttt atgtatttat tttttggaga tggagctcgc
64081 tctgttgcct gtctggagtg cactgcagtc gatcatagct cactgcagtc
64141 ggggttccag gatcctcccg agaagctggg actacaggtg tgtgtaccgc caactcagctg
64201 attttttaag tttttgtaga gacagggctc atgttgcaac ggcgtgctgc gaactctctgg
64261 gctcagaaga tcttccaacc taggcctccc aaagtgtcgg gattcacagg atgagctatgc
64321 ggcgccagcc tcatgaagcc ctcttaattc ttttctctc tttttttttt ttgtgacaaa
64381 agctgttctc tgtccaccag gctggagtag agtggcacaa tctcggtcca ctgcacacct
64441 cgcctctcgg tgcgaagcga tcttctgccc tcagcctctg agtagctcgg actcacaggtg
64501 tgcactacca tgcacagtaa tttttgtatt ttttagtaga gacaggggtt ccgcatgttg
64561 gcagactcgg tcttaaacctc ctgacctcag atgaccaccc cgcctcggct tcccgaaagt
64621 ttggggattac aggcgtgagc cactgcacct tgcctaatac ttttctctct tggaaagcatt
64681 taactcatca aggttttttt gacgacctac tgtgtgcaa taatgggtga caggaaaagt
64741 ggatacaaca ataagttgtt tagattattg tttccaata ttcactgctc ccaactcttg
64801 taagaggact gtacatcccc ttactccacc ccatgcccca tttatataaa ctggggcattg
64861 tcaactgttt ttgccaatga aatatgaaca gaacaaatat atgtcccttt tggacaaaag
64921 ttttaagaga ctctgggtgt tctcttttK ctctccagta ctttttctc ctgcataga
64981 atgcatgttc caaatagaac ctgctgcttc agcacagacc cttaaaagaa tggatgtcat
65041 agaattggtc cactgcgtgac acatagctgc cagagKcaag atcaagagaa ggtgagaaaa
65101 aaagccattt tgcgtttata tatcatttag atttattaca tagcataacc tggaaaaaac
65161 tgaattattac agtaaaacaa cacagactga ctactatgt ttagatgtga tttacattcta
65221 gttgaatgcc tattatatat catctgcctc attcaaaaa gaatcttcta tgaatcatct
65281 tgtttttctga tagtttttcta catgcaaatc tggcccaaaa ctaagaatta agcgaagcat
65341 tatattcttt actttactga atgtttgttt gtgcttagga aagtcagtag atatatattg
65401 ggtgattcttt aggaccocctg ctgttttctc actctttcta tcttctgtat tagacaacaa
65461 tacaagaata acagagattg aaaaagaaaa gttaaagact ggtgttttgg tagcaacca
65521 caaaatagtg tgaactcctt agatgaatat tttggcattt agataaatac acagttatta
65581 cactaaaaaa tagcatgaac tatttgaata tcattagaat gtttaagaag tttgcttatta
65641 gtaagttaatt ttataactgg ccaatgatat ttccaggtta acatctgaat atcaataatt
65701 aaaaactaag aatatgacct aaaaaggaaa atattattca ttttctctca tatgtctaat
65761 atttttgaag ttttaaaaaa tcatttgtag acaaaaatttc gtggtactaa atgttttcc
65821 tttcaggcat aatgtaaaca gaaagcctaa actccagaga aattattatta aagtgactaa
65881 atatgctgta tacttactct taactctgaa caaagtacct ataaaagttt tagcttttaa
65941 atcacttctct tattaattaa ttttaataat taccggctct tcttgtgata aaagatcaga
66001 cagatgcmaa atgttgacac ccaagaacac agagtctcag acattattat ccaaggcaca
66061 tccgttagaga gtggcccgaa cgatataaag ggtacatcct gttgaagagc aaagttaaca
66121 Ygttagataa tctagaagag cctaagtggg gagcttaata aatttggatat cctctatata
66181 tacagtgtct ctcctttttc tgaagtgtat actttgcaag acccccgagt aacgcctgaa
66241 accatggata gtatacaact ctataaacac tacgttttat tgaactgata cccaagacag
66301 ctaataagca atcactgggt ggttaacaca gatagtgggg ataaagtggg caaaggagtg
66361 attcacatct caggcaggat atagcaaaac actgcaagat ttcattYgcac tattcagaat
66421 gtcttgcatt ttaaaatgta tgaattgttt attcttggtt ttttccattt aatatatttg
66481 gactgttgggt gaccacagaa agtgaatcca tggagtgtgg gactactcga atcaacaac
66541 atttttagaac tacctaagcc aaatatcatg ttgtttcatt ttgttttttg tccagtgaac
66601 aaaaaaaccc caaataatag ctttgttgaa taaaactctg ataaaaata ttaggaatt
66661 acaaaagttt aaaaattttt taaaggggaa aaatccataa tctactact ttaagaaagc
66721 cattaataat caaataattt aattctgcct tacagagttt tcatagagtt ttaactgagt
66781 gcaaacctag cacacataca attttaaaat ctcttttttg acttatccca gtgattttcc
66841 cattaactta aactctttgc cagcatagtt taaaagaact gacgctgatt aaccataaat
66901 ttatttaaac atccccctac tgcgggaaac acaattattt gaggggtataa tttttgaaa
66961 gtggaaaaaa atctttatca atcaaaaatt tctgttattt ggtatttctt acttagcttg
67021 gattacactga aggtgaattc agggaaatgaa Mtttagtt ttttcaata ttgaagaatt
67081 gttttccaaa aggtttgtac aaatttgcaa tctactagt tagataagct taataaact
67141 tgtcagtata gtcattgtgc acttaatgac agggatata tcttgagaaac atttcgttag
67201 atgattttgt tctgtgtgta acatcagaga ctatagctac ataaacccag atggcattat
67261 ctactacact atagggtata aaccaataaa gtacagctgt ttaactgatt ttatgtatg
67321 tactgcaggc aattataaca caatgggtgaa tattgtata ttttaataa ctaataactg
67381 gaaaaggtga acatgttgta ctatatattg ggaccacttt cgttatcaga tgcataactg
67441 tattataaaa tcttgaaaact cctaatttga tagtgaggaa ttatgtata tttattttgc
67501 atttccatga ttaactgtga gctgcataa ttacaaaaa tgttttatgc atttgaatt
67561 tcccttgggt attatccatt tatctctgag aatcttctct ttagtatcga ttgatctct
67621 taccttatat aaaaataccc cagttttctt tgatcaattt tatgtatgga aggttaatac
67681 agtatataca ttttaataaa aactatcatg aagatataaa tctgtgacac caccatact
67741 acaaaagcta acccccact taaaagatta ctcaactgca attttttat tcaatagaat
67801 gattttagtc acctgaataa agcccaaat ttaaaattt aatatattct taagtataat

67861 ttcataagcaa atagtgaagc aattttaaatt attttaattt aaaggagaca aggtatataa
67921 tgggagagata gagaaaaact ggaagacctg aattatagtc ctggtttggc caatttttct
67981 ccatcttaatt ttgtgatggg tcattttact tgtctaggtt tcatctttta aaattttttt
68041 ttcttttttg agacagggtc ttgctctgtc gccacaggct gaggccaaca cctctgacat
68101 cccaggtccca agccgtctct ccacctcaqt ctcccaaat gctggggaca cagatcgata
68161 ccaaccatgc tagataattt ttaaatgttt ttagacaga aggtctcaact acatcgcca
68221 gggctggttt gaactcctgg ctccaagaga tactctcaat tcaagctctc aaagtctgag
68281 gactacagcg gttagccact atgctgtgcc tagatttct ttctgtcatt tacaagaata
68341 agtgttagat ttgataaat ctgttggttca ttccacctcc aaaaactctgt cttaaaattc
68401 ataattgtat ttgtcttttt tatagggtac ggtatttct ttctcatcca actccctgtg
68461 cctactgctg taactctcac cttaactaca ggtcacacag ccacagaggt cccacaagct
68521 tctactaac ttccagcctc ttttctctgt tcaattatca cttttttttt tttttttttt
68581 aggcagagtc tagctctgtc gccagggtgg agtgcagtg ccacactctg gctcactgca
68641 acctctgtct ccgggggttca agcaattctc ctgctcagc ctccagagta gtgggata
68701 caagtgcctg ccaccatgcc tggctaattt ttgtactttt agtagacaca aggtttccac
68761 atgttgccca agctggtctc gaactcctga cctcaggtaa tccaccacc tgcgctacc
68821 acagtgtctgg gattacaggg gtaagccact gtgtccagcy ttttataatt ttaagcaca
68881 ctactactact ctactgtcac cccaatatgc tcaatttctt tctctctgtg cttgagcct
68941 tggataactat acccatttac tcaagataaatt cctgctcact ttcccaaaat caggtcccat
69001 gctcacctctc cagYgggacc ctgctctgcc ttctactcaa gccatcacc ttctcgtgt
69061 cccctgtgat aatgggtgca cactgcatc ccagctatc atacgccata ctgggattgc
69121 cctactgttt ttccaccagc ccccaacaaga gtgtcttctt caagtagtaa gacggcctc
69181 ctactgtctt gtctggacac atcacagggt ctaaaaaagt cactgtaata aatgggcat
69241 cagggaataat atcacataga gaataatttg tcaagaatca ctgggtaata tacaagatc
69301 aattgtttta atgttctgat gtgaatcaat ttaacttgtt tcatcagggt tctgggacc
69361 aaaaaaaatt gtttttatt gaactactgt atctgttaat gtgttttgtt cccatgtt
69421 ctttactgcc cacagcaaat atcttttcaa gtaataatag ttaaaaactat acagactcta
69481 ctatggcgcc gcaattatcc aagttaataa tatatattgc acacatttaa tccacaaca
69541 ctttggggag tggattattt ttaccctta tctgatacat gaggaaactc aggcagtaga
69601 aagattataat cacttgccca agttacagtt gacaagaat agaacccagg ttggaatcac
69661 acaatttgcc tttaaagtct atactcttac acatgaatga atgttctgtt atctggaaa
69721 cttaaacacac atatgaagc acatatagaat aaagttaagt agggagagat ttgcatgtt
69781 aaggcctatg ctctaagcta attgatatac tctaatttca ttaacaagaa ctctacttt
69841 ttgcttgtct atggcgctga caaagaatca tctgaagctc tcaattgtaa gcccatctta
69901 tgtcagttac agaaaaagt cacaagaatc cagttaggta tcttacctag agttaacatt
69961 cccctaagaa atatcatatg aagtggaaga gtagtgtgaa taaccaacc aactgcaaaa
70021 caaataattg ctacatgaaa aaccagatga tgaattctct tccagtttct caaagtggtc
70081 ttattgggaag gcacaggtat gatactttct aactcaggtg taaaacctat ggcagtgtat
70141 tctctcaatg ggtctggact tgaataattc attttgaaa tctctgtaa aacaagtaaa
70201 caaaagttaa atcgtaaaaa tggcaattgt atctttttac ctctataggt attataccaa
70261 aattatttct gtgaattaaa tagactcttc tagtgcttat gaattagaca gccacagatt
70321 caaatcccaat ctgtgcacat attaaagtta ttcaagtctc taccgtgttaa aagatgttaa
70381 taatcactca ttgtccttat gatcaaatga aatgaataac ataaaactat tagcataggt
70441 caaaactatt cccctatagg cacatatata cgtataaaca cttagagga agggaggagt
70501 gagggaatta gtctttaaaga taatccacaa gtgtctataa ccatggtaat tcaaaagtta
70561 tttagtctag tcttccatca aattcccaat ggtcagatga tccaaacaca ggaataataa
70621 ctgagaaact aattatttga atacttaaaa aatatgaata cctccacatc tattgaggg
70681 cttaggatat ttagaaggct ctatttttat accaccatta aatcactgta tcatcatatc
70741 ataatactat atcatatatg caaataatat atagccatat aaaaatttat tcatatatac
70801 agagatacaa catgaaactt ttaattgtctt acaaaattaa aagtagtaaa ctctcagttt
70861 atctacactg gtacgataatc acaaaattaa aagtagtaaa atatacatt tacaactgct
70921 atgaaaaatc atagcaagta catttaagga catatacatt taacactgct aaactatgta
70981 cacttctcat gtacctgtc tctggctccc ggtcctttaa aaactctgta ttatttggt
71041 caaaaatttg gctcttgcca acaactatgt aggtttacag attatctgaa tttcttgtt
71101 tcaggaaaaat tccaaatggg gacctaaat acattttaa ttagaaatat gtattttctt
71161 caaaaataagg tcatgcaatt aatcttactc ttctactgct tgttcttaac atacaaggg
71221 ttattggtag tagaataaatt aattgtgtaca aaatgggtag ttggaagga tgttaacaga
71281 caaatgtgaa agaatctcac agcttaagga tgaataaaaa caagcacacc aatttaca
71341 ttgtgaatga aatgatcaag tcaactgaag atctttttac ataatctga aatagctcat
71401 aatatattaa agtaaatagt gacttaagta ttgatttgc tcaaaaagga aggaatcct
71461 aatgacctta ttctccaaat gtctgaatat agcaaatata taagcctatc aggatggcgg
71521 gggggaaagt cattatttta ataactccat ttgacttttc ttatcacaac agggccaaac
71581 gagaatgaat ctgcgaattc ctgcaggaca gagaatgata ttgagttatc tctatcact
71641 ataaccacac ataccctacc ctgacattac ataggttat aataactatc atttccagac

71701 cactgtagaa tgtacctaca ctccattgt cctgtttgtc ctctaggagg cagggacaat
 71761 gttttattcat ctatgtactt ccaaggccta gctctgttag agaggagcac tggagacagg
 71821 atgaaagacca ctctgaagga acgtcaacct gataaacact ttcaagaact ctggttccgt
 71881 cctcccagcat ctacgataa aagccagagg agtgcttagc ctctctaggg ttgagttagt
 71941 ttctacaccca caagccacca ggggtgtaca taagccaggg aaagccactt ctgctctctg
 72001 ggtctgttttc ttctctggaa tagggaaaaa tttaatagcc tatgtttcta taataacact
 72061 ttacataaact aatcaatcaa tacaattgtc cctctcagtt caccocattt caccctgtat
 72121 gcttataaact ccaactataa tcaaatcag gcttttcaaa gttcttaagg tgcactataa
 72181 agtaccactt tctgtgtcca gaataatgac agggaaacta ctattatgac ccaagaacca
 72241 aaaaataata ttgacagttt tagaaggta cggctatctt aaacatgttt tgcagcagca
 72301 cacccttatta aagagagaga gagaKatata tagatatatg tatctatata tctatataat
 72361 tgtcttatgtt gaaatgccag ttacctattg tcgaaaaata tgatcagact agtttacttt
 72421 gattaccact taactgttaa gtggcttaca cttaacaatt ctatacaga gaattaggtg
 72481 aaagagaagg gttgactgc taatttggtt aacttttcag attaattttg actaaatcaa
 72541 gagaaattat ttttccctca tcagatcact aaagtgtgaag tcttataatt cctataacta
 72601 gtataagttt gtttatcggt ttccaatag gtgattgtag gctcaaatag ctaaatgtctg
 72661 aaactaacat taacctcta ccaactaaa aaattgaaa agataactgc aaacagcgt
 72721 cttgtctagt gaattaaatt attctgtaatt tctaactgaa gcttccgaca tctcccgaat
 72781 ggcaaatggc attacattgc taagagtctt ttccgactta tctatgtctt caaagcagca
 72841 gtttcttgga gtttctgtgc caacaacccg ttcccaaggg ctccgggaag gaggtctggt
 72901 gtgggtctcgg cgggacctcg gtccccagcc atccggcgctc tccccggggc cttctgacct
 72961 gctcctttaa gaggagggt cctgtgcaac ggtctctctc ggccagggcg tctccgggag
 73021 cgggggtcag gagtgagcgc cgtggcccac cctactctcc gagcggggag gggagtggcg
 73081 acaccctcgcc cccgctgca cgcaggctct cgcggcgctc gcggcgccct acagggggag
 73141 agggagaaacc ccggagactc ggcggagaga gcagagacgg agctcaccaa ggggcttgcc
 73201 ccccgagagg cggggagcgc gcaactcggg gggcgaggcg cccggggagc tggggcgctg
 73261 ctgacctgag cggcgccgcg tgacctgtga gggctctctg ggcgcgagcg cccagaccgg
 73321 gggagaaagg cggctcccaa gggcgaggag cccctcgagg cccgggttag cgaggagagg
 73381 cagggggcgg cggccccggc tgccccggcg cgtMgaacaa cgaactgtccg ccaggggcga
 73441 caaagtgtct ccccgagggg ctgagatcca actttcgctt cccgatttag cagggggagc
 73501 cgagagccgc acacaacccg gcgcgggggg aaagccggct gcaactgcgc ctccccactc
 73561 taccggctgc gtccctggcg gggagccttg gcagcgcga ccaaagttcg cccggcagct
 73621 ttccggggcg gggagcgcgg gcacacggcg tcagctgctc gacgggagcg cagcgcgcg
 73681 tctctggcgg gtccggcggt ccggaagctc cgtgcggcgc cccgggtccc cagccccgca
 73741 gcgcctttga ctaaaatagg catcgcgag gcggcgcgag gcggcgcgag ccagggctg
 73801 ggcgcgacgc cgcagcgca tgcgccgcgc gcccgcgccc ccccgcgggg cggagccagc
 73861 cggcgcgccc aggtattccc acctcgctcc cgcgactcgc ctccgggtct cgcagcccg
 73921 ggactcgggt tgaacgccc gcttatttat ttcttgttcg cctcgctaca agatttctat
 73981 ctgttttggt catgagtgg ggcggcagct ctgttgggac cggcggaact cgtcgttctc
 74041 ccttacgggg ataattcgag aagtgcggtc cgggtaggga gagaaatcag tagagaaaa
 74101 gagaagaaga atctcgttt cccctcaaag ttggaagacc cactcgtata tctctctttt
 74161 gggagatctg cccataactc agcaaaaaca gggaaatgac cggaaagcgc tgcgattccc
 74221 gtccgattgt ggcggggggg gctgaacgtt tggctccacc ggtgacgaga cccgggggtc
 74281 aggcctctct cctcgaggga agagggggaa gaggccgcgc gggaggagct ctgcagacgc
 74341 gccactgttt ttgttttcaa acaggggtac ttaaccgaaa ctgacaatcc caggcggtaa
 74401 aaggccctcc atcgtaggca aagcactacc tgaattttaga ttggggccat cctgttgaaa
 74461 ataagacatg agagtatgct ccgatcaact ttactgttc actgcgacaa taatttgggt
 74521 aagaaaaagg aggaactta ataaagaatt ttagttgttg ggaattgtct tggttaaa
 74581 tagaggaagg tatagatgggt acccagtttc caccaaaagt gtccattat tggttaaa
 74641 tggcatcagt tattagatta tgagatcgtt catcgtgtg aaatgtatc ttgataaaa
 74701 aaatcaccac accgattgtg tgaagtgaca ttataaagag taacctgaag tgcacctgtc
 74761 caagctctct ggttgaagag atggtgcacc ctatagaag agagactagg ccttgatgtc
 74821 accaagcgcg ggtttgaata ctccccctcc taccagttta ctgtgtgacc ttgagaagt
 74881 taccctagccc ttctgtccct cagtttctct ttgggacaat ggggataatg atgataga
 74941 tgatgatgat gatgataatt atgataattg taacctgcact tcatagata gttttgagg
 75001 ctaaaagggt taattatata taagggtctt aaaaagtgtg ttgggacata cttctgatgc
 75061 atatatattg tatttataaa actccttttc taatcgtctc gaaactttct ataaccata
 75121 aagattactt tttagatta ctcttttaga gttctgttct ttctagatgc tctgcagcc
 75181 tttttttttt gaggcagagt ttactcttg ttgcccaagc ttgaggtgcaa tggcgcgact
 75241 tggcgccact gcaacctScg cccccgggt ccaagcgtat tctctgcctc agctccccca
 75301 gtatctggga ttacaggtgt gccaccgtcc ctaccagctg ttttagatgc taccactaaa
 75361 tacattttaa ggtgtgggta tacaagtgtg cgtaaagact taactacaca gatgttact
 75421 ggggggtgat ttataataat gaatttga aatgacctaa attcaacca cagggtacta
 75481 agtaaaattat agaacatcca gacagtctg ttaatgaag agcatgggcc ttgagttcac

75541 acaagctggg tttgaatccc cccctcctca ccagtttaaa cagccattaa aataaaaaaa
75601 catagaaaaca gactctatgt ttaaaaacac atttcttagaa agtatattata
75661 gacatcataaa taagtgtctac taat tatataa aagcaagcta tgcocccaaaa acccagagccc
75721 actgcctggt tttgtatacc catttttaca tttttatagg ttgaaaaaaa caggaagaagg
75781 aatatatttcat gatattgtgaa catttatataa aattcaaatgt caggtgtccat aaaggttttat
75841 tgaagaccgg tcaacgttcat ttttatggct gctttcatgc tgcagtagcg tcttggata
75901 tctacaagag aaacccatttg gccacaaaag cctaaaatgt ttactctctg gctctacaga
75961 aagaagcttac tgaatgcctca catagagtat actttgtgtc aggcagtggt taagaatga
76021 tagatatatt gtccactatt acacacccac tcccttacct caggatgaga taccgtttaag
76081 cgtgtatgat cttataaaga ttgcacattt ttatgaaaag agcactgaat tgaattatcat
76141 aagattttgag ttctagcctt tcacagagtc tgtgttttct ttgagttcgt gtctctatagg
76201 aagtgaagac tggaaaaaac ctaatccccct cactaaacc catctaggat tgaacacctt
76261 atttataatg agtatcttacc tgtatttttaa ttcttatccc cagatgtatg aatagtatgt
76321 ttataaaaatt caaagcaaga attctaRaca catagcccag gatattggaa tgccttaagc
76381 tccctggctct cctcctgctg gccacagaaa ggctcagatt aaagcttccc agcgcatttt
76441 tgaagatttaa tatgaagcaa ggaagctaatt tgacacatcg ttgaaatga aaagggtaag
76501 aagcatgata aacaaaatac aaggcagctgt gtctcctctg taaaaactct ggctagtgtt
76561 agattgacat aactattttt acctttattt cctataagcc actctttagt actctttagt
76621 gtgtgataaaa accctaatga gacttcaaa ttccagataga ataagttttg tgaaaaaaaa
76681 caaagatctg aggaagtcac ttgtttttaa agtacacata ttttgggagg ctcgaagtgg
76741 cggatcacctt aaggtcagga gtcttagcca acatgttgaa accccaattt cactaaaaat
76801 acaaaaacct gcccggtgtg gtggtacatg cctgtaatMc agctactctg tagcttaagg
76861 gacaggaatt gcttgaaccc gggaggcaga gggtgcgact agccgagatc acccactgtc
76921 actccagcctt gggcaataga gtgagactct gtcttaaaaa aaaaacaaaa aacacagac
76981 tcacataacca gtaagtacgg ttatatttctt tatctacaaa tctgcccatt gtatcacata
77041 gttgtagattt tatttcaact gttattacta attgcatgga gactatagca gttcttgata
77101 cattctcata gcagacagtt ctggtcacga ctggtttctg aaccacattt cctctcacta
77161 attttgtgcat taactttttc actgaccagt ttgacaccca tctcactga ttgtttttac
77221 atttcttttg atttttaaaa aattaaatgga ctttttttaa gagcagttca agttttacaga
77281 tgactgagca gatagtttcc ctcatgatta acaccttgca actgtgtggt attgtgtgca
77341 caaaggggaga actcaaaYtg atccatcatt attaaacaaag gtctgttagtt tactttacag
77401 ttcactcttc atgtttgaga ttctgcaggt ttgccaatat gtaataatgc atgtatccac
77461 cattacagta tcatacagaa caatctcaat atactgtgtc gcagttcttc atccctctgt
77521 ctatctctct gccacacccc tggcaaccac tgactttttt tgactttcca tatttttccc
77581 ttttccaaaa tatcctattg ttggcattat ataattgtat gccctttcag attggctctc
77641 ttccactaagc agtatgcatt aagtttcttc catgcctttt ctttttttaa ttgtgatgat
77701 gtatatattg tgaatgattt accacaatca aattagttga cacatccatc acctcagata
77761 gttaccattt ttatgtgtgt agtgagaaca tgaagatct cactctctag caaattcagt
77821 tRtaaaaaaa agtatagcta actggagcta ctactccatt cattggatcc ccagagctta
77881 ttcatcttat aactggaagt ttgtaccctt tgaccacccc cccggttttc ccacccctta
77941 gccccKggta actgtattct ctgtttctgt gaggttcaact tttttagatt ccatgcaaaa
78001 gtgaggtcat acaacatttg tctatctctt tctgaactat tctacttagt tgaagccctg
78061 cctttttttt catgttacaa atgaagaagt ttctctctt tatggctgga taattattca
78121 ctgtgtacat atgccatatt ttctttatcc atctctctc cagtggaacg tctacattgt
78181 tccctgtctt agctgttgtt aatattgctg caatgaacat gggagtgagc acctctctt
78241 gagatactga ttttatttcc ttcaatatat accctagaatt gggctgtgct gatcatagg
78301 taattatatt ttaattttt cagggaacct ccatactgtt tccgtaatg gctaatacag
78361 tgcactacc ccaccaaat gcacaggggc ttctttttc tcaattctg gccataact
78421 gttacctctg gtctttttga tagtagccat tctaacaggt gtgaggtgat tctatcattg
78481 tagttttgat ttgcatttcc ttgatgatag taatgggtgaa cactttttcg ttgtcttgtt
78541 agccatttgt atgtcttttg aaaaatgtct attgaggtcc ttacctattt attttttat
78601 ttttctgtgt tgaatttatat gaggtttctta catatttttg aatlaaacc catcacagag
78661 attatggttt caaatatttt ctccccattcc ataagttgcc ttttcaattt gtgtattgtt
78721 tcttttctgt tgcagaagcc ttttaagttg atggaatccc acttctttgt ttgtctttgt
78781 ggtatcatat ccaaaaagtc atggccaaga ccaatgtcaa gaataacttt tcttacctt
78841 tcttctagtg gttttatgg ttcaatttaag tcttlaatcc attcagagtt aatttttgtg
78901 aatgtgataa gataagggct caataatcag tcttccaaaa acaattttat aaagatacta
78961 tcttcccccc attgtatat ttgtgtgctg tcatcaaaaa ttaacttgat ataacaacat
79021 ggaactcattt ctgggctatt ctgtttcatt gggtctagacg ttgtatttta tgcgtgtacc
79081 atttgtctga ttactgcagg ttgtataac agcttgaat caggaatagt gtagccctta
79141 tcttttgtct tctttctcaa gattgtcttg gctatttggg gtttttgttt gttgtttgtg
79201 tggttttgtt cttttgagat ggaagctcac ttgtttggct aggcgtgaggt caggtggac
79261 agtctccgct cactgcaaac tctgcctcca ggggttgaat gatctctctg cctcagctct
79321 caaagtagct ggtattacag tgcgccacca ccagttctg ctaggttttg tatttttagt

```

79381 agagacgcgg tttctccacg ttggccaggc tggctctgaa ctccgtgacc caagtgatcc
79441 acccactcgt gccctccaaa gtctcggaag ggattacagg cgtgaqccac agccctcggc
79501 ctattttggg cctttttagt ttccatgcga attttaggat tttttttcta ttttttggaa
79561 aaatgccatt gaaattttga tagaaaaatg atttagttta tagttattcta ttgttagtat
79621 agacattttta acaattatata tccctccgaa ccacgaaagc aggacataatt ttccattttt
79681 tgggtctctcc tcaattttatt tcatcaatgt ttatctctct taggttatag ttgttttagt
79741 ttcttggttta aatgaattgc taaatatttt attgttttga tgcgtgtgtc aatgaagattg
79801 ctacttcat ttcaggtaggt tgttattcat atacagaaat acaaatgggt ttcaactgtt
79861 gatattataat cctttaattt tactgaatgt gcttattagt tctaataatt ttgtgtggag
79921 taaacagggg ttttataat aagatcatgt ctctcgaaa tacaactttt tttctcttcc
79981 tatctgattt ggaaggcttt tRttctttt tctgcccac cgaRgaattt cagtactgtc
80041 ttaaatagaa gacaagacac tctcgtctgt tctcgtact tctcgtttcc tttttctttt
80101 tcttttgttt ttcgagacga ggtcttgctg tattgcccag ctatagtatgc agtgagcatga
80161 tcatagctca ctgtggcctt gaactctggg ttcaagtaat cctctctctc cagcctcctg
80221 agtaactgca actatagctg tgtgctgcc aagcccgtca attgtcataat ttttttagag
80281 acagRctcca ctgtccactg tgttgcccag gctggtctca aactctgcgc ctcaagtgtg
80341 ctcccccact cagctttccca aagtgttggg attacaggtg tgaagccacca tgcccstcca
80401 gcttctcagc ttccaccattg agtatgatgt tagctgtggg ctgtgtatatt aacgtctttta
80461 ttgtgttgcc gaacattcct ttgagagttt ttlatcatga aaggaattgtt aatttttgca
80521 aagctttttc cacagatact gagatgatca tcatatggtt ttgttatctc actctgtgac
80581 ttgtggtgat catatttatt tatttgtata tgttgaacta tctctgcatc ccagggtaga
80641 actccccctt actatggtgt gtgaaactct taatggttgt ttgaatttag ttcttagta
80701 ttttgtcgag gatttttgca tctatgttca ttgaggataa tggcctgttaa tttcttttcc
80761 ttgtggtgtc ctatctggc ttgtgtatga gggtaattct gggcccataa aactgttttt
80821 gaagtgttct ctctcttccg gctttctgga agagtttgag aaagactgac gttaaatata
80881 aagttaaagg ttgaagcttt aaatatttgg tagaaactca tagtgaagctt actgttgcct
80941 ttaactttct cgttgagtct ttttattact attcaattct ctacacattt ttgttctgtt
81001 ctagattttt attacttatg atttagtttt ggttagttgt ctatgtttag ttgttttatt
81061 atttttttta ggttacccaa ttgtggccat ataattgttc atagtatgtc ctatagatct
81121 ttcttatctc ttggttatca attgtaacct tcatgttctt tttagtctta atagcccata
81181 ttcttttttt actggtatga ccacggttca ttatccattt taccattttta aggcactctt
81241 ggtttctctc agttttggca aattatgtct aaacataata aacatattgt ttgaggtttt
81301 ttgtgtacac atattttcaa ctcatttggg taaatactta ggaatcatag tgaagactat
81361 gtttaggttt ttgaagaaac ttccaaactg tcttccaaag ttgctgcacc attttgcaat
81421 ctactagaca atgaatgaca gttcctgttg ctccacatct gtaactaacat ttaataactat
81481 catttttttt taggggtggg ttggggagttc tagccattct aatagggtgt ttttttactt
81541 tataaattga ttcaattact taattttgtc aaaataacca aacaggttat gcactcaaca
81601 ggtctcatatt ttgtctagat ggaaaaactg aaacaacatc tcaagtcgaa gggcctaaac
81661 ttgttatta ttgttttgca agtcccgcgc tctaaaaaat gcagtgtcca gatactgtta
81721 atgttaaat cagggaagaag ctccctaaag tcatgtaaaca gtttaactat tggacaataa
81781 acttttccaa aaaggcttca cagctcctaa aagaaatgac acacaggtgtt ggcgtgtgat
81841 ctcatgcctg tgaccccagc acttttagga gctgagggag gccgtttgct tggcccaaa
81901 agtttgagac cagcttgggt aacatggcaa aaccctatct ctacaaatgg gccatcatgg
81961 cgccttggcg cctgtagtct cagctactcc agaatgtgag cgaggatgag cctcttagcc
82021 tggagcgtga aggtctgagt gagctgtgat cacataactg cactccagca aggygacag
82081 agcaagaccc ttgtctaaaa agcaagcaaa caaacattaa aaacacacac gaagcagcac
82141 accgtctggg acRgtggctc acatctgtaa tccacgacat ttggggagcc gaagcgggtg
82201 gactcacagg tcaagagatt gagacatcc tggccacat ggtgaaaccc tgtctctact
82261 aaaaaataca aattagttag gcatgatggc ttatgctgt agtcccagct actcggggag
82321 ctgagggcag gaaattgctt gaacctggga gacagaggtt gacagaggtt gactgtgcgc
82381 cactgtattc cagcctggcg gcagagcgag actcggtcta aaaaaaaaaa caaataacaa
82441 accccaccca caccacacca aaatttttaa aagtgcaccc gaactttaag aagaatgta
82501 attatgaagg cagttcaaa agtggtagct ttggaattag cagctggaat tgaacaatgg
82561 ttttacattt aataggctgt atgtgtattc agataattat ctctctgag ctccaattta
82621 ctgtctataa aaactgggaa aataactcat agttaccaag atgattttga cttttagaga
82681 ttatgttttt taaaatgcct agcatctagt tcttggtagc ataatgtcat atcttctgta
82741 tgccccatta agtgcctcgc acatggttca caattcataa aaattatttg aattctagt
82801 caatttgttt atggaataga atttgaatca ccaaaattcc ctagtctgaa gaataagttg
82861 aactatccta tgaacacatg aagttagtaa aatgtatttt catttttcta tatatttgc
82921 ttctttaaa atagtggaata cagaaatacac aaggtatttt aatagaactt gcttataca
82981 ttataagaat ttgatgcatg ctaaaattcc cagttagttt ggaatttccct ggaatagcta
83041 gcagatcaca aggtcaggag acaggaatcca cactgtgaaa cactgtgaaa cctgtctc
83101 actaaaaata aaaaaaatta tctggcgctg gtggcgggca cctgtatgct cagctgctgc
83161 ggagctctgag gcaggaaaat ggtgtgaact agctgtcagt cagctgagat

```

83221	cggtgccactg	cacttcagcc	tggggcaacag	agcgagactc	catctcctaaa	aaaaaagata
83281	cgccctctcaa	aagcaaaactc	atgaaatatg	caacagctcta	gattgtataaa	actgggcagat
83341	tggcgagagat	aagttacagtt	aattcaccatt	cttgggggttg	gcagaaatgtg	ctcatcacagt
83401	actatatttgt	cagaaacccag	aggccctgac	ttccctctgt	ctatcttttt	tcacatagct
83461	ttttctcttga	aagagaagaa	ttacatttgtt	taatatattgt	tttaaatattt	aattataacca
83521	acaaaagctgc	acagatgaag	catttctatg	ggtttctctaa	tccttttggga	aattgtttcca
83581	aagagaagaa	aattatttgt	agtaagcagg	catacaaaaa	tcgtgttttta	aataaaaaag
83641	gtaagtatga	aagaggatc	agagaagtga	ccctgaattc	cactcaatttc	cttaagaagct
83701	ttcaacctgtg	accaggaagg	attcaattctc	tgggcccagat	aggatctctca	aaacaaaaact
83761	ggatcagggg	cctaggtaga	taccccaaga	aggcgagatt	caaatgtctg	ggccactcta
83821	tagtgacaac	ctctctgttc	ttttgttctt	tcctctgttg	gaactcttag	gaatttgcag
83881	acctataaag	cccatctata	aatctcaagc	atgtccactt	tcagagaaga	gaatgtctga
83941	caaccatttta	gtctctgagg	acaacacttt	taaaagtact	Rttttatttta	gtgtgtaaac
84001	aacttctttta	tatgaggtat	ttagtgggta	gaaaggaaaa	cttgttaaa	gtagaaaaat
84061	aacttttggc	aattttttaa	agtatgtaat	ttagtggat	agataaagat	ttgatgtact
84121	gaaagtgag	ctataggctg	ggtagcagg	ctcacacctg	taactccagg	actttgggag
84181	gccRaggcg	gtggatcacc	tgagggtcagg	agttcaaacg	cagccctggcc	aacatgggtga
84241	aagccagctct	ctactaaaaa	tacaaaaaatt	agccagggtgt	gggtggcagat	gcttatatac
84301	cagctactcca	ggaggctgag	gcagagaagat	tgctgaaccc	aggaggcaga	gggtgcaggtg
84361	agctgagatc	ttaccactgc	actccacctc	gggtgacaaa	gagctactct	gtctcaaaaa
84421	aaaaaataaaa	aaaaaagtga	agccatgtaa	ggactcttaa	tcctttatctg	gtgaaagcag
84481	aactttcaat	tactatagag	tttctactat	gtgacataga	gttctgtatc	attttataca
84541	attactctctc	caaaaaggct	gggttggggag	gcaaataggga	ggcctgataa	tagccagcca
84601	agtaaatctga	cataaggcta	gaaacaaaaa	cccaagcgag	ccactcatata	agatgtaata
84661	ataaaataaaa	agttgggaat	aatgacgcgtg	ccatccggcg	ttaatgtgat	tgcaaaaagc
84721	ctcagttccc	aggagaaaaa	aattatttaa	atgcaaattt	ttatctattag	tactacttaa
84781	attgttgttaa	taaatctcatg	aaaataagac	acctctctag	tttaatacat	atataaaaaac
84841	taataaaattg	tttatgagcc	acatccagca	gtttttagcat	ttgtcataaa	aaattggtaaa
84901	acatgatgaa	acatttctct	aatccaagat	caaacatatt	tgtatatattc	tagaacaccca
84961	caaagtgtgt	gcaaatgcta	tttagtttga	aaactatagg	gcacctccac	actatccccc
85021	gaaagacaaa	aaagatcatg	ctttgaaaaa	gagattttag	agccatgtga	ttctttttta
85081	gagtatggRa	aaagatagaag	tactttggac	agagcagttt	gtgcagagag	ctgttttggg
85141	tttatcacgag	atatacagaa	ctattatgca	gttttactgc	atgccaacac	agcaaatttc
85201	ttaatatctt	tcagccacac	taagtcatct	gagttagaagt	gtatgattat	attataaattc
85261	cagaaaaatgg	catctaaaaa	caatagaRta	ttacagttgt	aatcaggaaa	tttttcaagt
85321	tttgaaggtY	tcaaatgact	tggttttaata	aataaataaaa	actgttaata	ctctagaaaa
85381	tgatgttgaa	tgggaaaaat	aaaatattgc	tattaatgac	ttggcattca	gtactttacat
85441	tattgtgtgac	ttaacatgct	ggcatgtgat	tcccagctgt	tttaaggtgt	gctcacagat
85501	gtgtgatccc	ctagagccat	ttttctctat	ctctgttatg	gcctttatat	cttgtacct
85561	tttcatattc	tatgtaaaaa	Wctttttctc	ccctcaggtc	aaaagtttct	ggaggataag
85621	aaagtgtact	gattttatctt	Ygtattctcc	gtggtgccta	gcacatgatt	tacatatattt
85681	tgggaactcgg	taaatctctc	aatagacaaa	acagtaaatc	tttttaaaaa	ctatgtttta
85741	caacttaaat	tattatgaat	ggggaaaaa	gtagaagaaa	tgataccaaa	tatgtttaata
85801	gaaatttggat	taggatagtg	gaatgattgt	cttttctttt	ttctatctca	actgttttat
85861	ataatcatatt	ttttcttaata	gaataaataa	caaaagtgaca	cttaatatct	taccaggcca
85921	tatttacttta	ttagaattat	ggtagcgtct	accatgaca	gtgacacccc	ccccccagca
85981	ccaccctcatc	actccccatc	accagcgtcc	ctctctcccc	tgctctgtct	agctgataa
86041	tgattgaaaca	ggaacaactt	gaaaaaagata	cglttgggaag	gagtgtgaaag	agctgtgtgga
86101	gcagagggaaa	ggtttaacca	tgagattcat	tcagaaattca	ttcatctatt	cagaaacact
86161	gagtggtctg	ataggtggga	aatgcttggg	gtcagaccgt	agcaaatagg	gaagaattgca
86221	gagggctcca	agtcagaggg	agcagcagag	ccaaccacac	ctcagtgccc	ataggcccaag
86281	ataccagagag	accaactacc	caagcaacat	tgcatctgat	ccaagggtgga	ctataggattt
86341	caagatcacc	ctgggcaaca	tagcgagacc	cccatctctt	aaaaaaatat	tgctgggttg
86401	tatggggcca	taccatggta	gttgaggcta	ctRggggagg	tgagggtgga	gggtctcttg
86461	agcctgggag	ttctaggctg	cagtgagccg	ggctgtgcca	ctgcactcca	gcctggggtga
86521	tggagtgaga	cctcattgca	aaaaataata	caattttaaaa	aataaaatat	aataactgcc
86581	taaaatggaa	agaaacatct	ttttaaaaca	tttaaaaaat	ttatgtggta	cataatagtt
86641	gtatatattt	atggggtaca	gtgtagcttt	tgatacaggg	gtacatagtg	tattgatcaa
86701	gtcagggtaa	ttggagtacc	tgtcacctca	agcatatttat	atttttttgt	attgggaaca
86761	tataatttcc	actcttttgg	ttatataaaa	ttatgcaata	tttatgttta	actatagctc
86821	ccctatttat	ttgtctactg	aataactgat	cttatctcat	ctatctaaat	gtatttttgt
86881	atccattaat	gattccactt	catRtccctt	tatcogacta	ccctctccag	tacttagtat
86941	ccatctattct	acttttatatt	tccatgaatt	cagtttttttt	ttcagctccc	acaaatggagt
87001	gagaaactgc	aatatttggc	tctctgtacc	tggtctattt	cacttaaaat	attgtcttcg

87061 agtttctatcc atgtcgttgc aaatgacagt atttcattat tttctgtggc tgaaaaatttt
 87121 gtctataaac cacattttct ttatccattc attctttgat gtgactttca tttgtatcca
 87181 tatctcttgc attgtgaata gtgcgtcagt aaacatggga gagcagattc tttctcgatatt
 87241 actgatttgc ttctttctgg acgtataccc agcagtgagg ttgctggatc atattgttact
 87301 tctatttttta atttttttgg gaaactaccat actgtctctc atatgtggctg tcttaattttg
 87361 cactcccacc aacctttctc cacatctcca ccagcatctg ttattccctg ttttttttgg
 87421 aaagggcatt ttaactgggg tgagatgata cctcatgtga gttttgagct gcatcttttct
 87481 gatgattagt ggtgttgact atttttctat atacctgccca ccatattatt taatttttgc
 87541 ctttttgagaa atgtctattc agatcttttg cctgctttta attttggattg atttttttcc
 87601 ttttaggttgt cttaaagtcc ttatatattc tggttattaa tccctgtgca gagaatagat
 87661 ttgcaaatat ttcttctcat tctgtgggtt gtgaaaatgt cctcttaaatg gcaggatcaa
 87721 atgtttgttt tctgccatcc ctgggaaaag ggtgtgagag ccatattatt atttgtatc
 87781 tttaaaatgg aatttatatc atccttgggt attgtggggg attggttcta ggaccccttc
 87841 agataccaaa atctgaggat gctcaagctc ttgatataa atggcctagt atttgcatat
 87901 agcatacaaa catccttcca tatactttta accatctcta gattacttat aataactaat
 87961 acaatggaaa ttctatgtaa atagtatac catattgttt ttatttttgg atcccaaggt
 88021 gtgttattgt tattttaaat tttttccaaa ttatttttcc caagaaatag taatttccca
 88081 tcatgacaga aaaaaaatgc tattattaca ggccttacct ttatttttgg atcccaaggt
 88141 ggttgaatct gtggctgtgg aacctcaca tacagggggc tgactgacct taaggaggac
 88201 atgataatcc attcatgttt tctgttataa aagaaaaattt aattggggagc ccatagggtc
 88261 gaggtggctg cagtgccctg ggtcctcatg taaaaaaacc aaagccaggt tgaacacgt
 88321 aaaaacaaat taagcttaac caatcagaaa ttgccaccca ggccttaact agggactta
 88381 cacactaac Rctgaagtat attttcttgg tctgtctctt ggactctata agtttctctc
 88441 ttgctctgcc cctcacagtg aagctctgaa ccaactgtag ccaactgctg cctgactcat
 88501 gaattgtctg ctgcccacaa aaactcttca aaatttttgt ttgctctaat ttactcttta
 88561 acattcccac caaagaatct ctaagcaaaa atcattttgt agattttcaa ttaataaat
 88621 gatcttgtaa cctaagaact aataactgtg catcctgaac aagtgctgtt cagactcact
 88681 tcaacagtat cagcaagaaa aaatgtgact ttgaaagtaa tttaaggaat taataactct
 88741 atatcataaa aaaatgctat tattatagtt cttaactttt atttctagag aacactacag
 88801 tggcactgca taattgaaat caacttgaga agggaaatca atgttaaatg ccaactacag
 88861 aaatagatgc aattggctgg gcatggcagc tcacgctctg aatcccgaca cctggggagg
 88921 ctgaggtggg aagattgctt gagcctagga ggcagaggtt tgagtgagcc aagatggac
 88981 cactgtactc tagcctgggt gacagatga gactctgtct caaaaataaa gatgcaatt
 89041 aYttctctct atgcaatgaa tatttcaaaa gcagctacca ttgtccaggc attgttctct
 89101 aacagtgaag aagatataga ctagtggaaag agtttcagag tagaattctt ttctctataa
 89161 gatggacatt gtgcttgtgc attggttaaa cttttatctc aaaggaaacca acttatactc
 89221 tgcagtaata tctgttctct cagaaccccc acttgtatta caccaaaaat ttcttccaca
 89281 tcttggaaacc cttaacctgtt gctatttgaa aaaacttcaag cttttacaac gtttctattg
 89341 acataaaagt ttattctacc tgagagaaga aagagaagta gcactacaag gggcactgaa
 89401 ttaattttct tataagaagg agtggatggc acataaaaaca tgatggggctg agataattgaa
 89461 ggtcttctct taggatacct agagagagac ctcaattgag ctctgataat acttgaaatga
 89521 aattggacag aaccaaaact ttaaaaactg atttaaaact catcgaaata atctggcctt
 89581 gtctcttctat tatgtaaact tatagccatt taaaaatagat ttacacttaa tgacacatt
 89641 tacttgttaa ccaactttga gctcaagcta ctgctgatga ttcaaaaagaa ttcaagtttca
 89701 tgtttgaaat atttttctct atgctgtcac taacagattt ggaagatgtg caactagcat
 89761 ttggggactt aattttctct caagtgcagc ttggggacatt ttgactctct ccaagtccagg
 89821 aacacagctca agaactaggt cagtgacaga tgaaaaatgc aaggacactg atttgaaaga
 89881 attagctcta agctgagtg caccactgtt tactaactgt tactcaactg ttctgatttt
 89941 tatccataaa atgggatctt tccaaaggaac aagcaaatga aatccactgt aggcattgtg
 90001 ttcataaaat atgaagtgtt aaataaatgt aagactattg ttgttaattt tataattttt
 90061 gaggttaatt tacattttaa aagagttaga atctcaactt tgatggcctg agacacttga
 90121 tattatacca agtggagcta aaattctatg aaattatgta tctcaaaaata tttagaattt
 90181 tttataaata aataaaatata ctctattata gatcactaaa gcttgaattg gaaataaaga
 90241 aaaaagggga caattacagt tcaagacaca aattactcag tttagggagc aaatgtttg
 90301 taaagtctcc tgccaactct taatagctag taggttttaa aactagtcga atttagcata
 90361 gcaataaaac ttgaagtatt gttcaaatca tgcctgatat agtcaaaat gtaccattca
 90421 gcatcacagt catggttaata ctacagatga gatgactaat agttaaagta accaggtttt
 90481 cagctcttgc gcatcttttc acagctgtga gagtccggt ctgaaataa tacaagcttt
 90541 tatcaaaatt aaactgcatt ttattataat aggtctatat catactaatg ctattttgta
 90601 tttttgtatt atatgtatgc gttaaatttt agtgaatga agaaaacacg ttgaatttaat
 90661 tggaccctat gatctcttta acttgtataa aaactgtctt ttaatacaaa gtaatactaa
 90721 attggcacat cattttcgaa gtttaatttc tcaaacatg tgcagtatag gaagaacatg
 90781 gaaccgcat agaaagtgc atccaatgct gcatgtatat ttatggctt taactcaaca
 90841 agcatctcac atacataaaa ttgtaaacgt attgtcttta caataaatg tctgtctgc

90901 ctatgtttgtt tttcttatgg ctcttgtcag ctgaggaaat ttcaactttgt aactgccctg
90961 ttaattctgc tttcttgggt ctgagcagtg taacaatgtg gcatccagag ctattccaga
91021 tgagcggtaga gcaaatgaat ttcttctctg tccctgttg agagggagag aaaaattctt
91081 caacgtgtgaa gtgtccagag agcatcatatc tattctttac agtagactaa tctcaagacc
91141 atgagttctct aggggctgca gactccaagg caaatccac tgatctcttc tcatatttgc
91201 acaggggtgca aatcaagttc agaggaataag ccccatgggg atgggaagcc tccagatag
91261 caggtataagg aaagggcatg caagagagaa gctgtcagcc tccaggactc tgcctttggg
91321 actggggtgt ggggtgttta cggcctcatt ttgtgccaaa gcaactctct ttctccggag
91381 tcaactcttc tcagagtccc tctgaccatc gaaaattagg acagaaaaat accaaggcag
91441 caccocaaat tcttaagtc taggaacaac tcagctaggg ccagctctct gggcagtcga
91501 cctgtgcagt cacaaagggc tccaggctta caagagcccc gcaacttgga taatgctctg
91561 ccatctccat ctgaaatttc ttaagactct ttgaacaaag agtccattta tttatgaata
91621 tccagactctt gtatacaaa ccaataagca tttttagcac aagaacacaa gctgtgtctc
91681 atcttagtgc actcttatca atgacaagag aaccaaggga tggaaaataat tagcttaaga
91741 ctaaaaatgag ccccaatttt aataaaaatt aaatttttag ggcactatga tacagaggtc
91801 agagggtattt ttctaggata tgtgtcattt ctgcttcca tctggtttga ttattttgag
91861 atagtattgtg gtttgcata ctttcaaac cagacatata atacagctca cttaaagcta
91921 ctgtaggttt ttgatttttt tttttaataa agtgagaaaaa cctgagtga aacctagta
91981 ttggtataata gcatatctgt taacaccaag gaacagtgcc agccctatcc agaatgtag
92041 actgtgaagt ttcaagcat ccttttacct cctcttccag tatcccttta tccattat
92101 tttgtaccct tttctcctta tagtaaaaa agatttctgg gaaacttaca ttaaaaaatt
92161 tgtccctctc gccactgagt tgagccaaaa gctacatcc catttctagt ttgctttgtt
92221 ctctgctgac ttttaaggtt agaaagctat ctgataatta atccctgtaa aattattacc
92281 tggtagtact aacttaagat gtgacttcta cctgggatgc tctgattttt aactcttat
92341 aaaaatctcca aagctttaa gattcaagaa atgaatttct cccagagcca tggtaagcc
92401 cactgacaga ccaagtggtg ctctctgaag gctttgatt gcatctgcca gacagctgcc
92461 tctgtgtctg ctgtgaagag ctgcccatga tggcaatgtg tggccaaaga atagaagaaa
92521 ccatctcagat gattcttcta gttcatgcta aactgaata gctcagtag tcatccagac
92581 taatgatttta catcttgtca cattgtccca cttaaggtag atcttaacat acaggaagaa
92641 caacgtctct tacataacc cagtaacttc tctccygttc tctgtctgta ctttgtctcc
92701 taggtcaccc agaaaatgaa aatcactgga gaactttcac aatctctcac cacactctcc
92761 acttgccagc aactactctc acagatactc ttctcttttc attcatgaag aattgtccat
92821 atttctcttt aaggccactg gatcccatca cctgtccaag gtcactactc ccgcagttca
92881 Ytctctact attgattatt tccatctgca tgcaaaatga ccatcttata tgaataatca
92941 taacaacccc ctctcttgac cccactttct gccaggcta ctgactattt ctatttctca
93001 tcacatcaaa actccttgaa aaacttacct acccttactg ttccaacttc ttgctctca
93061 ttctccttca accgtcttca gtccagtttt tgttctgtct cactccacca aaactgctc
93121 tgttaagttc cccagtgaat tccatgttgc ttaacccgat ggttcaattc caggctctc
93181 agccacatct gagacagttc atactccct tctccagaa attctcttt ctgtgctcc
93241 aggatccag gctcctctga tttcttttct acctcatgg ctgctcttcc tcagatcctt
93301 tgcgtattct tccccatgc ctttgtcccc ttaacaatgg atgtgtccaa ggtaagctc
93361 agacatcttt tcttctgaat ctacactcac tcttttggcc atctcatga gactcatg
93421 tttaaatccc atgtatagc taaatactcc caaagctgtc tctacagcgc agactcttct
93481 ttgaacatcc aggtcatat ctccagctgt ctactctact tcagcgtcta ggcagcatc
93541 cactcttaa cctcatttta ctttccaaat ccacttttt ctctcttccc ctactctat
93601 tctcagcagc ctagccagag tgatctctat aaacactggg gcagatcata cctactctt
93661 acttcagacc ctacaatggc ttctgtgtac tcttagaaaa aatacaaat ccttaccagt
93721 acttatttag gccctaccaca gtctgccac ggttacttct tgttacttct ggtccagcca
93781 aactagcctt ccagctgtct ccggaacagg ccagctcatg tcatgcttaa gggcctgtc
93841 agttgtcgt ccccttgccc aaattgtct tccctcagat tccctcagat attcttcat
93901 tgcctcttct aggtcttcat tcagacatc ctlttttggg atactttctt gaccacctt
93961 attaaaaatt caatgccctt tcttaccac tcttctaat tcttactctc cttgtgact
94021 atcactctt aaacatttac tgatttactt tattatgtct cccgcatccc cagaagttaa
94081 gctttatgag ggggtgggac tccatctgtt accgtgtga tcccatgctc gactcagcc
94141 atagaaggtg ctcaatcac acttgttaaa tatttgataa tgtactctg tatcaagaa
94201 catagctctg atgtgatctt cagaaaMcca gatttccaaa gtttccaaa gacttccaa
94261 ctagggttct ttcttaagct ctccacaag ctgaagcact cgtctgtgag cagaccctg
94321 tgtttgtgag gttgggtgag cattccctgt gaaccctgc tgccattca cactcagaa
94381 agctcttctc gctgaacag tgaaactgaa acaccctgca acatttttac tatgtgtca
94441 gggatcactt tttagcttag taatgatcag gcagctttgt ttccaggaa gacttctt
94501 ttaagtatta tttatttgt agcaataaaa taggtctcaa gattcacata tttatctc
94561 tctgtttat tctacttttt agtctRatca agtaaatgca catttaaat aaatnttgc
94621 tttcactgga ggttgtaga aaaaagttaa ttcggaaat gctatgtgg acagtagcaa
94681 cccaccctca gctgagaat actgtctgac tSttcttga ggaacactc ctgagctYat

94741 agggcgaagc aatgcatttg agtaaatgtg agaaaaagaat tgagaaagatg gaatttcatt
94801 tccccagatt ttgatgcagaa aggggcaaac tgccccatagt tttccacccc cttcccacatt
94861 atacaataga gaaatacaag aaaaatttgt aaagtatttt cacaatcgag ttgttgaag
94921 gaattaaaaa ttgggcaatg gcattctcgt tctgaatttg atttataaaa acatttagga
94981 gctctttttt tgtattttgc tatttcactg gggaaatgat aagagagaagt ctttttttat
95041 acctataaat ttcagacttt gatgtcattt atcacagat atctgtgaat tctgaaattt
95101 ttgtgtcagg ggtgatctgc gtattttctg agttgacatt tgatagaagt tgggtagccg
95161 aatatcatag tgatatcttt ttccatatata taccctgtca tccaagggcat agagtttatc
95221 tgcaattgtca ctgccaatta gcaactgaaa aaNgcggag atgtagcagt gctgcagcaa
95281 ggcagatat aatttctttc tctccaaga cacatatcga caatcagtt cgtcagtgag
95341 ggttacctaa aaaaacacag accacacata aacagatgtg gaagcaagaa aactctcgcc
95401 accttttttag taccccaatt gttaaattaa ttccacgtgc tgcttttttt ttaggttgaa
95461 aaagcccact gacctacaat atattgcaaa aatagaaact acaaattctg ttactacata
95521 cRtaatttat aatatgaata atcacaatgt tctagccatc ttcaatctgt ctgttttttt
95581 aaagtccagt atctacattt cttttattga agggagaact acttgatctt aaaaaaaaa
95641 aaagtgtgct gatgttacag aaatatcttc aagtcacttc tgaagactgt ggcactttaa
95701 ccctaattgc gttctctcag tagaaaaacag aatttatata cctaatttgc atacattatt
95761 gagtttgatg catcacacaca tataatttgt agaaaactgt gtaacaaaat aatgaaacc
95821 tgctgaaagt attatctttc aaaactgccca gacgtggcag cacagataagc acagtaagt
95881 tagcattctg ttgctgtaaa acaactgaaa tccactggca tttaaaattt taanaactat
95941 ttattttttaa gtaagtgcag ttttttgttc ttgatgtttt ctgagcctgc cattagaagt
96001 gtttagtcaa atctcaatta tattttaatt cctaataacg cagttatcga aacttaacgt
96061 taaagtattg atcacagcct cttctctgtc atattgtaga cctgttcttc tcatcgtctg
96121 acctataaag tggcattaat catcaagagt ccagcagaat tgggaaagtc atgtatgtgt
96181 caaagtacat tccaaagtct taaaattatc ttgtcttata cactgttgtt tattgttttc
96241 cttatttttaa acaaaacatc tggttgaaag agggagtgct aactgttgtt ttgtgtatcc
96301 cttacctgaa aatgccttc ctctgtgggt ctcagtgaat cccactcagg agaattccag
96361 aactgaagg ggaattgta atgcagaaat tgcgcataca ctgtcactct gatcctatca
96421 aaacacaga acaacattta taagggaagg agaaagagag cacataattg gggaggggtg
96481 ggggtagatg gaagtgtatt tcaagatccct gatgactctt gccccttatg attttgaaag
96541 gcaaaatttt aaattcatatc attataataa gtgacataat gtctgtgaag attcattgta
96601 tcatgttctc tatcacgtca ggaattctgga atattgagtg aaattcatca gaaaattcat
96661 caagtgttac atttataat gtccatttat gtgtgcata tataactcaa taaaacattt
96721 taatggactt tctcagattt taaattaaat agggaaacat atgaacatc agagggagttc
96781 tgcaaatacc tctgtaaac aaatttttat tttttattta ttttttgaca gagtctcact
96841 ctgtgcoccca cggtggaagt cagtggcaca atctgggctc cctgcaccca cgtctccca
96901 ggttcaagg atctctgtgc ctacgctcc ttagtagctg ggattacaag cgtgcactac
96961 gatgtccagc taagtttttt gtatttttag tagagacagg gtttcaacat gttggccagg
97021 ctgtgtctga actcctgacc tcaagtgacc cactagcctc ggctcccaa agtgctggga
97081 ttacaggcgt gagccacgc gcctggccty taagccacat ttttaacttt ttgaaacca
97141 tgagtaactc cattattgtt tctctccca aactttgttt tcaaagttta tttttttta
97201 tttttgagat agagtctgt tctgttgctt aggctgaagt gtagtggcgc gctcagct
97261 cactgcaacc tccgctccc acgctcaagc agttctcctg cctcagcctc ccgagtgtc
97321 gggactaact caggtgtcca ccatgctgg atattttgt tttctattgt ttccagtaca
97381 gatgggagt ttacagtggt ggccaggctg gtcttgaact gctgacctca ggtgatattc
97441 ctgctcagc ctccaaaagt cgtgggatta cagggttttt tgggattaca gttgtttatc
97501 accgcacctg gctgtttttt aaagtttaga ttcttatata tgttcttgaa gtgtctcccc
97561 agcctgcttc tcatgggcaa ttgctagaat ttactaga aaaaagaata ataataagaa
97621 ttaaattgtt tctgttactt aaaaagaagc cctatcaag agtctttaga atattttgca
97681 cgccaatata gtaattctat taattcaagc tgacatcatc cttcttctaa ctttcagat
97741 ttaggaaaaca aatatcatat cacataaaca aattcatact ttatgttaatt tgatttcta
97801 gatgaaatat taaggctctt gattattttc tgtctcaagt aaataatgac atataYtcta
97861 aatggctctt tctgtgactc aagtatcaaa gacttctcca agcctcaggg tgcataaact
97921 caccagagac tatgtgatac tgagatggaa aaatatagt gaaacactca aagcaagga
97981 atacttgagg aaagacatgc aagcaccaaa ggtacaaaac tctcgtgaac caaagtaacc
98041 agtttatcaa tgggaagttt cccctgcagt gcataaacagt gttccttttc

LOXL1 genomic sequence (SEQ ID NO: 5)

>15: 71935151-72007300

1 gaggtagctcc cgggtgctgc tggccggcgc gccccaggcc cagcagcggc gacgccacgg
 61 gagccccggc cgtcgccagg cggcgtccct gccctcgcc gggccgctgg gctcggaacac
 121 cgtgcggcgc caggcgcggc acccattcgg ctttgccagg gtgcccagca actgagccagg
 181 ggtggccgtc ggggacagca cgggcatggc ccKggccccc acctccgctt cccagcaacg
 241 gcaacgggrrc tccgctctct cggctctcgg ttccgcttc cggcacacct accccagca
 301 gccctctcac ccgacagcgt tccctatccc gcaggcgccc ttccgcaacc agtacagaaa
 361 ctacgacccc gctgcgcgga cctacgacca gggttctgt tactactacc ccgcggggcg
 421 cggcgtggcg gcggggggcg cggccgtggc ctggcgggg gtcatctacc cctacacagg
 481 ccggggcggc tacaggaggt acggcgggcg cgaagagctg ccagtagtacc cctctcagg
 541 ctctctaccc gcccccagga gggcctacgt gccgcggccg ccgcggcccc ccgacggcct
 601 ggacgcggcg tactcgcaca gtcgttacag cgagggcacc cccggcttcg agcaggccta
 661 cccgtgacccc ggtcccagg cggcgaggcg ccatggcgga gaccacgccc tgggttggt
 721 cccgccccac gccaacccgc cggccgaggc gtcaggggcg cccgcggcg caggagccta
 781 ctacgtcgcg gtgcgcagct ccgacacgccc cccgcggggt ggggagcgga accgcgcga
 841 gcaggggcg ctcagcgtgg cgacgtgtta ccggcccaac cagaacggcc cggatagta
 901 cgggccccgc gccctccgg cgcgcgtac cctggccca tggaaactgc tccggcccc
 961 ccggggccct ccttagaact tcttgaggcg ctcccggag ctgtcaaga cggagcagc
 1021 cccctccccc acttccccgc acccagccaa cagcaccccc ctggcatctc accctccagc
 1081 ttaacccccg cccaggcate atcagtgcca ggggttgcc aggcaggtgt gctccttgat
 1141 cctggcttgc gtggaggagc tagccgagct ttggggaggag gctcgctct tgcacttggc
 1201 ttgggtcttc taggacaaa aggaaggagc cctcatcca ccttccctc catttcaagt
 1261 agggcatctc cttccccctc tagagatgtt ctatgccagc tcacagggtg aggcagaagg
 1321 catcagaaac tctagtcttc agggccagaa aggccttaag ggaagcctt gggaggtggt
 1381 caggctgccc attactgggc atgtgtgagg ttggccttag tgcgcaggag gttagagcag
 1441 agcgtgtgct ccaggcagga gtcgggactt cctcagggga cttgcgaagg ctggggcgag
 1501 agagacagct caggcactgg cctgggtgca gaatttccag ggcataccaa aacacagta
 1561 gttagagatg gtaattattga gatgtatttt tttaaagtaa aattaaagca aaaaataaaa
 1621 aaaaaaaaaa aaacctgtga taaaggaaat atccagattt taatagagt cagtaaatgt
 1681 ggtatgcgga gccattatgg agcctgaggc taactgaaaa acagcaaca cagatccgtg
 1741 ctttatttga tatttggata tttgttcat tacagtagt ttgtcaattt tttttattt
 1801 aaaaactatt gtgttaataa ttaYttatct ccgttactga gtttttttgg accccctaa
 1861 aattttgcac ccgaggaaa aaaaaaaaaa aacacctcac tggcctcatt cccctcacc
 1921 tagtctggcg cctggcgagg agccccagct gtggacagga cctcctcgg cttttcagg
 1981 ggtgaacata cgtcctcttc ttgggaaggc ccaagccctc tgcacatgag gacacagtgg
 2041 aaaggcagct tccacaYatg ctgttagcag acagggctac tgtgacaagg gactgctgtg
 2101 ggtgtggccc agtgctggac ggccatcagc cattctctgc tgtcctagaa cccccctccc
 2161 tgctaccctc tccatacagg cagcttttgg gccaaagttt tctactcagt tccataact
 2221 tatgcagctc aactctgcct tgcctctttc aagctgtcgt cagtttctc tactagcct
 2281 tctctgctcc ccattgaggt tgcgWgctt gggccaccaa gtaaggctc agccacct
 2341 ccagtgcttc agagtatagg tgcagtgtcc ccagctcctt cctcagcctc tctgacgaga
 2401 gggatagatc ttgtctcca gccaaagctga cctcagttag gggctctgc tctaggggtg
 2461 cctgtctccc tgggtactgc tggaggccaa gactagggga gaggagctc tccactgga
 2521 acactcactc tatcacatcc aaggtgtcgc ttttagttg ttgtctgaat cccactttga
 2581 aaacctcgag gagctcagga aaaaatcagat ggcaggtcct tctgtgtgtg gatgaaggat
 2641 gcatccactc gctctggtcc ttaccaggtat cttgcagcat cctgcagaa cggcgcatf
 2701 tagccatgca tcaagctctc tagggccctt tggagaatag gatgtttac cttagaggtg
 2761 ctaaactttt cgagtgcctt tcttagaat gcaagacctc agcatgaggc tctcctgat
 2821 gggccccacc tctgggcaga gaaaactgag cctcctcaat cccaaatYt ggcagagga
 2881 tgcctgggac ttggcatctg ggcaccaagt cagtgggtgc cagtgggtc agccaggtc
 2941 gttagttgt taaggaaagg agttgattga gaggggagat ggcacaggca aggccatgtc
 3001 tgaagtggcg gtgttgggt cttagcagac cctggccac tactcagc accagaggtc
 3061 attttgggtc aaaaacattt ctccccgaa ggttagcatc tagtgcca gctgagtgt
 3121 ctacatgca tcaagttccag gcccttcccc ggggcagctc accagaggc gactctagt
 3181 cctgtgatta gccaaagcatt ggtggggcca gggcctttgt gaggccagag gaggccctc
 3241 cctgtcaggg gctaggcctc agggagactt ccaagctc ttaggtctaa gctctctgc
 3301 aagggatgtg catcagcacc atccaggtgc ccttcccc ataatgag ggttgggtg
 3361 gggagtgtgt ttttctgtg ggaggggatt gcaggctagt ttagggctca taaggagcc
 3421 agagaggagg cagttagtct tcccatcatt ggttctccc tcccaacct ctaggcagc
 3481 accgtggaaa atccagccc agggaaagcc aaagctgtg cttgagatc gacccccagg
 3541 cctgtgtgtg gagcccaagg cggattctcc gagactgact tcatctccc tggccaca
 3601 cccaggggtc taggctggg cgtggcagc cctgtgtgt gttgggggt ggtgctgtcc
 3661 tcaacaacc aagcacatgt gagccacacc caactccctc catgggtggc tggtttcaa
 3721 gcgcctgccc tgagccaggt tcttctctg ggtactctgt cctcttctc tcttaccaa

3781 ggcactgaga ctgcccaagg ctctctgcag taccattctc tccaactctg aaacatgaaa
3841 ctgaaaaagaa actagaggaa acagaggccc agagagggtc acatactctg cctggctctc
3901 atagcaaatc cttagagaga ggccctggagg gtggccagcc acttcccagg cccagctggg
3961 tctctctcac tgtgtMgget cctctgatgt gaccactcct tctattacca accaggccctg
4021 cctctctctgag gatcctctgcc tcagctcctg cctctcttga gtttcaagctt gtctgcagctg
4081 ggggtctctag tgccacctaa gaagcccacc agcccagaaa gaccaaaacc cctcccacca
4141 ggcccttacc tcgacacccc cgcctgactc accggtctct gcaactcctg taagggaaca
4201 tggaaacagc agccctgggc atctcccagg ggcactcttg atgctctgct tagccttgc
4261 tgaogtgtgt cctctatccc tgactctNcM tgcccaatca gaggccagga gagaaccgca
4321 gctcctcctc cctgggtccc ttgctcccag tctctcctc tctcagctct gctcatagct
4381 gggcagataa acccctgcag tctgaccagg ttactcctct gctcaagaag attStgtagc
4441 tctctcagggc ctltaggaca aaatctagtgt tctcagccca gcaactccga gttagaggca
4501 cctcctctctc gtcttcttct cctccttttc tcaagcctcc acagccccc tgggaccatg
4561 ctgctctgtg gcttagatgt tacacctccc tagacacatg caagggtgatt cctgggtac
4621 tctccttctc gtccagcctc ctgcccacaa gaggccagac ctgtctggac cctcagtcoc
4681 tgagagcagc cctggctgcc tgcataccac tctcctgct gaggccctag cctcagctgg
4741 cctgctccac cccacttcca caggctgcct gccactcctc gcctccagg cctctgcct
4801 tccctctcag agtttggagt agatgcaggg aaggaccaaa gcaggcttca cccaacaagc
4861 tccagagatt agagcccaga ggcagggata ataataccaa cttggccatt gtctgaagac
4921 cacttctctg gcttactgac ttcaatgtgc agtttcttc actctcaaa cctcttaag
4981 aggtgcagat tatgtctctc ctggtgtaga tgaaaaaca ggccctaggga ggtgtgcagc
5041 aagggtacag ccgagcttga attcaaaact aacctgtgct cctctcatca cagttagactg
5101 acccaggagg atatcatggt cagcctgcgg gcagggtggg gaggggatg agcatggacc
5161 cctctgcagg ctttgcctct tgggtctcca cctcccacat ctgcactctc aggaagaatt
5221 atgcttgcat ttgctgagtg cgttatacat catctcctt aatccccagg tcttagccag
5281 gtactgttat ttgtctctRtg ttacagatgt ggtgacgagc tcacttctct acctattcat
5341 tgggaaccag gatttgagtc tgtgtgactc tctatctctg gttcttaaca accatgcatt
5401 taaaaaaaaa atttatatat tattgcttat cttgtacacc ttgttacctc acctattcat
5461 ttggtctRtc attcattcaa cagatatatt agtgcagatg tctgggactc ggtgtgtgca
5521 ggggtgagatg ggacagtgag tgtgaaagac tttggaagca gactctctcc cagctgtctc
5581 gttagggtgt agcctgttca tggctattgc agattccaga acgtttgtgt aaaaaactc
5641 catatggtgc ataactaagt ccggacactg ttcttggagt ttgtcagtta gactcatcta
5701 atcctctgta caaccctggg attgttatcc ccattttgca gatgaggaaa cttgtgcctc
5761 gagaagttaa gcgacttgcc ctggaggcag aatacacgat cagcatccct cctcctctcc
5821 ccgaagtgt ctcatagtgt tcttccagaa agaaaaagag tcttccagct cctcctctg
5881 tgtcgaatca gacaagctgt ggaacaggag ggttctgggc cctcctctg gctcctctg
5941 tctcctttga gactcatcag tgtctgaaca aacaagtga gctctaaaga gctctcaatc
6001 aggcagactt cctgtctcct ctcttatcag ccaattgcaa ggcaacttcl cttccccctg
6061 ctctcaactc ggaccatccc tgcaagaaga gacagctcct gtttcaata ataagaataa
6121 gaatatctga tatttattga acatacacta tgctaagcat ttatttttc tcatttaatt
6181 cccacaacag ccttgtgaga taaatagtat tatcagctct attttaaga tgaggaaact
6241 gaggtctcga gaaattaaac aactcaccca aggtctcagg gtttaatgta ggcagagctt
6301 agacctaggc tgaacttcca atccagtggt cctgtgcctc actctgtctc gtctcttagg
6361 gacgggtgtt ttatattctg tgtcacctgt cctgtgttcc actgtgtccc gtagggtga
6421 acacctggaaa aaaaacaaat ttgggttttt gcttcaagtt tggggggccc acagagttgc
6481 tggggatggt ggcagagcag ggttgggagc cattagtacc attatggcca caggttact
6541 gctagacttg gctctgggagc tctgctctt ttgctctcag aggtgtacc ccttctcct
6601 gtctcacttg cagcatctc ctctcttcta aggtgtacc cctcctcct gctcctagt
6661 agtctcctgag tccattctac ctctcttcta agtgggaaac acatggaaga ctctccagg
6721 cagtggctga cagtggcagg agaggaagg ggcagggagg gacgtgggt cgcgccaggc
6781 ggcccacacc tcttccaat tgtgtgccc agcatctctg cagaagaaga gtcagggttg
6841 gagtgtctga aagagaggtt tagacttgcc cctcccctg cctcgaacta cctctctcat
6901 ttccacaggc actggagcca agggcctctc ttttgcggg actcatgata acaggggttg
6961 ggttgggtct ggttccctct cctcttctg gatgggcacc cagaaaacag caggtctgag
7021 accacttgga aatggggaga ggggtgtcag aatgcacaa caggaagaga cacaggtgca
7081 gaaagcagag cccagagggc ctltgccaac caaacctcaa gacgaacccc atcttcccc
7141 ctgcttgggtg gccagctgga accacaggtt ttccaaaacc acgcaaaatc tttctgcaaa
7201 agaaaggact ctgggaatgc attccagacc tctgttgaca atgaaagctg tgcacacaa
7261 ggcaagtcca ccagactgtt tatggagtat gggcatgtgc tcaagcactt gccaaagcca
7321 tacaggtctc aggcctgag ctgggctggt agaatctcag gaaacttcca gaaaccttcc
7381 tggcctcact gactctcag cctggcagtg agaaaacaga cacttgggtg ggaagtggc
7441 ccaagtccat gtctgtctt gccagctctc agcaccact ctgcactctg gagaagctga
7501 ccagaagctg agtacagga aaagataata ccaactcaacc ctgcccactg gggctcttg
7561 ctggctgcag aaggcagata tcatctctgt aggaatatag gcagatata tctcatgagg

7621	aaatagtcac	ttacaaaata	tttattgagc	gacttactgt	atgctgggca	cgttctaga
7681	gctgggtatt	cattcgtgaa	aagaaagaga	caaaattctt	gcctctgtgg	atcttctatt
7741	ttcatgtata	aacataataa	atatgtaaaa	aaaatagaag	gtactaaggc	ctgttgaaaa
7801	atagagatag	gtagggaaga	tcgggagtg	aggagaggga	cagggtgcga	aggttgcacg
7861	gcctcatgaa	ggtgacacct	gagcaaaagc	ttgaggcata	tgagtgaacc	atgcagctgt
7921	ctgcaggagc	agcattccag	ataggaaagc	agccagtgca	agggccctgag	caggagagctc
7981	cctgggggtt	tcagggtgtg	tcagggtgtg	ttagaacaga	gtagagtgga	aatggaggtt
8041	taacaggaga	caggtcagag	aggttaatgg	gtccgggcca	tggggagctt	aggttgcatt
8101	tgagggggtt	tgctttttat	tttctgtgca	tcctttttac	tcagcgtttg	agctgagtag
8161	aagcattggt	cctgactgac	taaacagggc	cctgactgac	gttgccagag	gttgacagct
8221	gagagtcacg	caggggaaac	gacaggaggc	tgttccagag	agttaggaag	gtgttagcaa
8281	tgagggaagc	cagcttttag	gtatgttctt	gagatagagc	tgaggagatt	tcctgtcggg
8341	ttgatatgag	ggtatgaaag	aaagagaggt	gtcagggagc	acacagtggt	ttatgctcgg
8401	tggtgctgga	aggatgcaat	tgcttgagc	tgagatggga	agggctggg	cagctgaagt
8461	tttgaataag	atatgaaat	ttcagSWac	tgtagcaggc	ctgagagggc	aaggagggaa
8521	ccctcggagt	aactgaagca	tcaagggaag	ctctagagg	tggggtaggg	ggcaccagac
8581	agggcctgca	agggcgggga	gggctcaggg	gcagggggtg	ggttcaagct	gggagaaat
8641	gtgcatggag	tgtagagaga	ggcagcagag	gcttgccctc	tgaaaaaagg	gctgaacctc
8701	gcatttggtta	gcattgtctg	cctccccctc	agccccagct	gcttctctgg	cagctggcgc
8761	aatcaagcga	acacttacaa	atccctctgt	tgagtcaagc	ccttctctgt	ctgtctctac
8821	ccatttggtgt	Scgtggacag	tgagtgtgtg	aaaagggtgc	aggggtggtg	tggaagggtg
8881	ttcaggaactg	agcgggtggg	ctttggagct	aaagactgtg	tgccctctga	taggttagagc
8941	tggtgtgtgt	gtgtgtgtgt	gtgtgtgtgt	gtgtgtgtgt	gtacgcgcac	gcacatgcac
9001	agctctggag	tcaggagcaa	gggcaccatg	gagtcNgggg	gcttgatctg	ctgtgacatg
9061	ctgcagagca	cctgcctact	gatccttagg	atlaagagtt	ctggaaggct	aggttaagctt
9121	aaaccacaga	Yggcttttagc	tgccactctg	agacttctag	ctgttgactc	ctggggcaatg
9181	gggagccatt	gaagaccctg	ggcctggctt	gatggctgtc	cagctctctc	ggcttgagct
9241	gggtttacatt	ttcattatgg	ggcaaatggg	aatctgcagc	ccacttgcct	cgctctcac
9301	caagcagggtg	tggaactgac	agggcagtg	tgacaagtta	atttctctat	tgatagataa
9361	tcattttctta	gggaatcggg	cagccagctc	ccggcctgga	ggcctctgat	ctcatcattt
9421	attcaaggctc	ctgctctgca	gagctttctg	cttctctgcc	acctaggggc	tcctctggag
9481	ctctgctgct	ctagccaaaa	ctcccgctc	agcacatat	tcacaaagca	ctgaccagtt
9541	ccctcctggac	ttgttttate	ctccagccct	gggctcaaga	gatttagggc	cttttgcatt
9601	ccactttcca	tcattttgcc	ctcatgagga	ggaggcttgg	agaggaagaa	ttccagagac
9661	aaggtttact	gaacccacaa	aaaagaggaa	gccaaagggg	aaacagggtg	ggtgtggagc
9721	agcaatggga	aRgcagccac	agggctctca	gcgcaggcca	gcctccctcc	agaaaccgct
9781	gggcaggagg	gaacagat	ctaaggaagc	aggaaggatt	taggtcagaa	ggtggagaaa
9841	tttctctgact	gctaaagt	cRtctgtagg	ggttgtgaga	gggctcagga	tcttgcccaa
9901	ggctggggaa	tgaactgaac	agctccataa	aagtatttta	atctccaagt	gtttatcgat
9961	ctatccaaac	tgtgttcagg	ggccagctag	ttcagctctc	ctcatcatcc	agatggggaa
10021	agtgagccctc	agaaaaggga	ctggggagac	tggaacaagc	agtgaactca	cctctggagc
10081	ttcccccctc	agaaaggcccc	agctgcatacc	cacacaggga	ggggcagatg	ctttctgtcc
10141	tcgggttccc	gagggcgggc	acgggagccg	ctcagcaact	cagacaggcg	Rttgagcagc
10201	aggacagggt	gggcttgtcc	cgaagcacaca	ggccccagga	gtcaggttga	aggttctctc
10261	ctactgtgtc	cctgcacact	cccacagagg	aaagctcagg	ggcagagcca	ggatataaga
10321	tactgtgtct	gtcttctcgg	ctccgtgtct	tcactgtctc	ggaggtttga	aggatcagct
10381	atagctaaaa	ggcttaccoc	acatcagtg	ctggctgtct	ccctgtggaa	tgaattggcc
10441	tgaggacctta	ttccctcgca	cgcagctctc	ccccagcca	gcactctcgg	tttggtccat
10501	tcaagggtct	tcgctgcccc	gtgactcagc	atccctgcca	tccctggcca	ggctctgtgc
10561	agcctgcctc	tgaggaaaga	tgccccacga	ggccctcaga	ggcctcagg	ccccagatca
10621	ggtggaggac	aattagaagt	ggaagaatgg	agggcatgaa	gctgaagtgt	ggcttgggtc
10681	aaaccaaagg	cacacagaag	gcctatgaca	cagttaggca	agaccccagg	caggttctct
10741	ctctcctggga	gcaagaaatt	gatggtggcc	aggggtttcc	tggttagctc	gaagcaagcc
10801	atccaccacg	ttttgggtg	gtgagaccgg	ccccagctca	ccccaccag	tggttctggg
10861	ggcttgaggag	aagactgagc	agggctgtag	gtgaccagg	gagcttgctg	cgacctctca
10921	tacggcccag	gaggggacag	tacggccgtt	cactgtagcg	tgtttgtgga	ggtggagtagt
10981	agaggtgcac	tggaagtcta	aaacaggagg	ctggccgggt	cggttcactc	accctctgaa
11041	teccagcact	ttgagaggcc	agggcgggtg	gaacacttga	ctgtcaggag	tcgagagtag
11101	gctggccaac	atggtgaaac	cccatctcta	ctaaaaatac	aaaatttagc	cagagagagc
11161	acctgtaatc	ccaagctgctc	aggaggctga	ggcagagaaa	ttgcttgaac	ccgggagtagt
11221	gaggttgacg	tgagctaaag	tgccgcattt	gcagctccag	ctgggcaaca	gagctagact
11281	ctgctctcat	ctatctatct	atctatctat	ctatctatct	ctgaggttag	gtatagagaa
11341	caggaggcca	gctagaaggg	acatagagga	tgacatcgt	ggactctcat	gtagcagtag
11401	caggcagtgga	actagataga	ccttaaaagt	ttacatggac	tgggctccgt	ggctcaccoc

11461 ataaccctcag cactttggga ggctaagggt gccagatcac ctgaggctcag gagtttcgaga
11521 ccagcctgcg caacatgggt tctactgaaa atacaaaaat tagccaggca
11581 tgggtggcag ccgctgtggt cctagctact tgggaaggct agatgggaag atcacttgaa
11641 cccgggaagc ggatgttgca gtgagccaag atcgaccac tgccctccag cctgggtcga
11701 tgggtttcccc tgtattttgga gtaagcaaaa agacctcatt tgactgggtg cgggtggttca
11761 cgcctgcaat ccagagactt tggggaggctg aggcaggagg agctgggata atcacttgag cccaggagat
11821 caaaggctgca gttagccatg ttccagccac tgcttctctg cctggacaac agagcaaacg
11881 cctgtctcga aaaaaaaga aaagggtggag gtggcggtgg gactgtgata tgcactttca
11941 ccagggtccag gatcttccct taaaatgcat actttttgag gtgagggtct atcacacact
12001 ctgataataa ctggacttca cccaacattg gccactctgc ttggagggctc ttgttgatgc
12061 tacaagccaa aaattgcaga ccagcctcct tactcttaca ctgatctgtt ccacttagcc
12121 ccaactcaat caacctctt ttatccctt ccaacatcac ataatccccc agccccagg
12181 cctgcagagg ggccaagagc ccaagcctgc aggcctggct gctgacgaaa tgcctctgg
12241 gagagctgcc cagagaagga gccattgttc ctctctgaaa aaacatacca gctatgggag
12301 ggggtctgct attcctctgg accctggcaa ggatcctgag ggtgaggcgg gggggctg
12361 cctgaactcc tgaggctgct ccttccagc agcttcccc agctgctgcc tctgtgtca
12421 cccccatgct catgagggtg tgacagagg gtgactcaga gagggagta caggaggccc
12481 tgggtatgt tagagatgta gaacaagaa acttcaaaa taatggttaa agtgattcca
12541 ttaagtctt agaaaaggca taactaatc acagtatta gaagcagagc agtgctgcc
12601 tggggtggcg agagcgggga gaggacttac agggaaaggg ccagagggtg acagaaacaa
12661 tccacagctt gatttgggtg gaagccacac gcccttatac atttgraga acttatacaa
12721 ctgtacactc aaactctgtg catttactg tbtatagat acagctcaaa aagtttattt
12781 ttataaaagg agtgacagga ggagctctgg gagggcaagg agacttaga tccctctg
12841 gggtagccca gctcctctgt tgaccctgtg cagatttatg ggcttagacc tccctctg
12901 ccggtgcttc caaagacatt atgtgctgtg gtgtcttggg ggagagacat ggaaacact
12961 ttgggttccc tagaacagtc attaaaggag ctctcctgac agagctgtga ggcctttgga
13021 ccagtcagtc accctcaaaa caaaagtgtc tccactgagg gcgagttaga ctcagggctc
13081 gccatcagc tgccatctgg agcggaggag acacacacag gttagtatgg gtagactcaa
13141 gtgtagatca atacagatgg ggtgtgaga gaggagaatt tgtgcagtc tgagatcaa
13201 ttgcaatcag gggagacttc ccgcaacaag aggccctgc tgcactgga gatctctca
13261 cagtaaggag aagaagatga tcatctgtag cagggtcaa ggctcagat gtgcacaga
13321 ccccaaggc gtttgcctt agtctctctt ccaattctcc acatgcagta cttcacaaat
13381 gccctcctc cataactctg gcacttataa cctactcca cctagttta atcagactc
13441 atgatatac agcaattctt gtttttttt ttctcttta ctgaaagagc gttagtcct
13501 catcagggga caaacagaaa tgagacttag attcagaatt gctgataggc atcagacctc
13561 cgtctgtgac caggatcagg gctcgtgtgt tgaccagcat cggggatcac actgagacct
13621 ggaacagggc ttggtgtgtg atcagggtca aggtcagggt gtgtgccagg ccagggttc
13681 agtatgtgac caaggtcagc gcttaagtgt accagggtca aggtcagggt gtgtgccagg
13741 gtcagggtgc agactgtgat caggcaagg gctcagtgt gtacatagt cagggttgg
13801 agaggcagc agagcatgt gccctcactg gccccactg gcctcttct ccgctcctc
13861 caacttccct ggggtgcata gccagctcat gaaatagctt agataggaa ggtcaggca
13921 caaaagcttt gtggagccat ctgtgcagta ttcttgaaa cctggcctga ctgtgggcca
13981 cgaagctgtc tgaatgcaaa tgcgtgggtc cctgagctt aaggccagc tatcccaacc
14041 tatacgcagc taggggaaa gcactgggtg atggggaagg ggcacatccc tctcatctc
14101 accctcccc cagaggcttc cagggtccag agagtgaaga ccagctccca gctgggtga
14161 gggcctagg gtcccttggg aaatgactgc aaacattcct agggctctca ataacactg
14221 ctaggctggc caagaagtcc cccaccagcc agggagcacc tgagatcacc cctggctgct
14281 actccaagct tctcatcat tccaagtagg cagggaagag aaagttaggt tctgggaact
14341 cccccatgag gccaccggcc cagacacttc tgccgatggc tctgggaact tagaagcca
14401 ttgggtgggg gatagctgtg cctaaaagct ctcaatggc tcttggcagg ccttctcac
14461 ccttgccctc atcttcaga ctaaaagct ctcaatggc tcttggcagg ccttctcac
14521 tgggaatag ctcaatggc ctaaaagct ctcaatggc tcttggcagg ccttctcac
14581 tccctcaga gcagaggact tcaaaagaa gacagcgaat ttaagcagc ttaacagctc
14641 ttaactgaga gaatccctga ggcagagag ggcagcgaat tagagccccc atgttatcac
14701 cccctttaagt cagtggctgg gctgggtag agccccagg cctggagtcc cccctgccca
14761 caccactgag tggccgcaac cacccagacc cagacccat cagcaaacca gggatattc
14821 cctcttctt ccaatgcaga atggagtctg gacacctaa tttggtttct gcttattct
14881 agtaactcct ctgcagactc aggcagtgcc ctgcatggcc agggaggaag gtaggagga
14941 cggagcagcc ccgggtctg gcacatctg gggaaacaag gaccacaag accggggcag
15001 tctccagact tccctgggct gcttgagacc aggccttga ggggagagag cagggtcctc
15061 cctcaggttg gtggccggag gttgcagaca gaggaggggt tggtaggtc taggtgtgat
15121 atggcagaaa gtgtggcag gtaagggagt gcgggggtat gggagaggt ggttgcaac
15181 ggcagaaagg aatcctgaga aggtcaggct ggggtgccag gctgagatcc ccttctgctc
15241 agcagctgc tctggggaag tgttttctt ccttctgctc

15301 cctgcacgac tgcctccacc tggctctgccc catgaacett cagggaacaca ctcacggcca
15361 gaagccagcc gctctcttgg tggtttaccaa aqaatgctga ctcaggagat gaaggaagacg
15421 gagggtgtct gggggctgct gtccagaggg ctggggagta aggaactcag gggatgctcc
15481 tglcagaaaa ttacatggtt cactcattcc tgcctccagg tctttgttca tgcgtgttct
15541 cctgcctgag acaccccttcc cgcctctctg attctctaaa tctgcgccca ctcctccagat
15601 cttgtctcat tccaaagcttt ccacgaagat cttagacagt ccccaacgca aagactcgag
15661 atgtaagctt ttgctgcctg acttccctga ccccaacact gggcccgaga cctcaaacag
15721 aaagaaagt gcaaaaggtt ttggggtatg agagatggt ttgggtgtga ggaagctctc
15781 gggacttagc agtgcccaac ctgatgctct caatgatcat cttctctccc tctcccctct
15841 cctcccaact gcccactcca ggtctccctg acttggtccc agaccccaac tatgtctcaag
15901 catccactta tglcagaga gccacactgt actccctgcg ctgtgctgcg gaggagaagt
15961 gtctggccag qtaaggagct gaggcagaag tqtatagttg ttggatagtc cccgggagtc
16021 acccaagacc cagcctagct gtggctgcca gctagagctgt ctcaagctgt atgacctgg
16081 ccaagtgcce cagcctccca ggcctctgac cgtttcata ctgacgtctg cctccccega
16141 gggagtccag aggggagggg agcaagYggg gggccagcat ttctgtatcc tgcactccac
16201 tatcaagacc actccacttt tactgtggca ctcatcttt atatgaagccc tgaagccatg
16261 gggtaccccc tcaggaaaact gaggagcaat gaaaggaact caaacctctt ggaatctagc
16321 tgttttaaga gaaggttctt ttggggagcc caggcttcca gtggtctaac agggaccaca
16381 ggaagtctta ttgggtggat gtacctgcaa gatagagccc aggaagtatg aggcattgct
16441 acagagagca gttgtggctt tggctggctc aggtcgctc tgcctagta cagcaggggc
16501 agtgaagccgc ggggacaaaq aagtttcagt tatatgttgc actggaagaa ggggaaagag
16561 accagttctc atgaacctag aagtgagca cagctggctc gccaactctc attggtgtatc
16621 ctgcctctgc cagtggttgc ttctaattta taagcagttc attttctgcl ggaactatagg
16681 tgccttggcg ataccctcct gggccaaaat aattagttaa gattatgta tgccttctt
16741 ttgttaatat cctcttatgt tgaagcacc tatitttctt aattaccctgc tttttggaca
16801 ttgtgaactc ctggttaagt tgacttttta ctatctagga aactctttag aactcaaca
16861 ttctctcatl tctagaactt ctagtctcat gccactctaa gtatcgtatc ataaacctt
16921 actcgtctgt acaagataaa agagcgttaa ctagaatgta actcaactga cctctctatt
16981 gagaagtgct tgccttataaa aaagaaaaag tatccgctga actaagcaga gtgattagga
17041 atgttgcaga gtcacattct ggtgcaagtt cccaatccca tcccaagctg cctcattgat
17101 ggaactgcgc cctggtccag ggcagccagg ctgagtagca ctcagccagc ctgctctggc
17161 agttcttctt ttgtttcagt tgtcttgggg aaagagacat aatgtctctg ctggaattc
17221 tccagcaatc aggaacttac agcctccatg acagcccttc cagtcttaag agaatatgct
17281 aaagtcaaac tattaacatc actgcctctt calgaaggat cctgaagtcg cggacctgac
17341 ctcccagctg gggagaggag gcagcctgtc ctctgctctg gagggtctcc gggaaaaag
17401 ggagagaaca gccctcactt gtaccccagt gacagaacca agacacagat gggaaaaag
17461 ccagaaggag tggttccagc gccagggtcg gaggtagtca gaggaggag ggaatcagca
17521 gggctgaggg ctgagaggag gtggggctgg gaggttcagac ctggagaatc cgcaaaact
17581 gggagccctg ggcagaggag cctctgaga tcatttcaaK accaatccca aggtctgctg
17641 cagttcacat gctgcaggca gaacccagag aaagaaaagg tatggccgc aggtctgctg
17701 ccagttttgt gccaaagtgc gctagaacc tagaccctta tggtttccca Yggtgtgctg
17761 agcygaacga aagggcagga tttaacYgaa cagagggaga gaggatgttt agtctcaac
17821 cagacataga cagattccaa gcctcccccga gacaaagctg agggcctttc atctcggagc
17881 acagcttagc cgcctgtgtg tccagacatt ctctcaaga gaggccttat cctactagc
17941 gggccacgct cccctctgac cttagatcg gaccttaat agtgccagg aaagagagc
18001 gaggcagaac gaggtagctg tcagccgtca gctaaagagg gtaaaagggc taqccacc
18061 tctctgtctc ctaccacaca tgtgtgtgca tgtgtgtga tgtgtgcat tgtgtgtc
18121 tcccctactc cgagcccttc gttctcttt ccaactttt ccttltgca accagctcat
18181 ctcaagttag aatctggagt cagcaggtga cttcgagca gccaattcat accagacca
18241 gtgtccctga atgaaaaag gcaggttgcc agcctgaagc catgcaatca gggagagtg
18301 gtctgagccc agtgcagat ctatagtgta tgggctgtg ctgagctagc tgcgttaga
18361 cctcacagc aatccggaat cctctatgag agcaatcagg gcagactcc tggagctgag
18421 gacttttaga ttgaccctag gatactgggt gaggtttga attctgggtc aagcaaacag
18481 catgggcaaa agtatgggtc agggaaaaag ttgagcctgt ttggaataa ggtttgaa
18541 caggacacca ggggtgtgtg gggagtgaag gggcagatg gactagaaaa gtgaaggagc
18601 ttgaccaga gnaactcagc tctgtttttc agggccacac agggccacac gctactctc
18661 gtcaacatct agggctctgt cttgtgtgca gagacttatc agaatctcct ggaatggact
18721 tttttttttt aaaggggttc tcaactgttt gccaagctgt gccaagctgt ggaatggact
18781 gcacaattat agctcattgc agcctcaaat tccctgggtc aagggatcag tctccaagt
18841 gctgggacta caggcataag ccaacttaac ttggcataa tttaattttt taataattc
18901 tttaattaaa tttaattttt aaattttta tttctactat gttgccagag cttgctctaa
18961 actatgggoc tcaagtga tc ctcctgcctc gaactccaaa aagctctgta atcacgagc
19021 tgagccaaag tgccctggcc ccgaatagg cgtgttttct agtgccctct cagagattgc
19081 tatgtctctc tgcacctagg ggtgcacccc agctgaccca cgtcagatca cgtcagatca

19141	tgcctatgctt	ggtaccgctt	tagaaagatg	ctgttgccaq	ctggcgccca	catggtggag
19201	gcagaaagag	aggggacagc	caggatttca	cggggtcaga	agacagagga	agagcgctga
19261	gccttcgcca	cagttccagg	agacagagga	gaagatcttc	aggggacagg	agtgaggcgtg
19321	gcagaaacag	gcgcaagggc	tgggggtggg	gctgaggggg	ccatgctggg	gtcttggtgt
19381	cactgtgccc	caaccccccc	Ycattctccc	cgccgtccct	gcagcacagc	ctatgccccct
19441	gagggccacg	actacagatg	gcgggtgcta	ctgcgcttcc	cccagcgccc	gaagaacacc
19501	ggcagcagag	acttctctcc	caaccggcca	cgggcacact	gggagtggca	cagctgccac
19561	caqtagtgag	ggaggggctg	ggcccgctcc	cttccacttc	ctctctgggg	caggagacct
19621	gggtgcctag	ctccccctcc	accatgagca	ctctgggaga	cacagatact	ggattagaggt
19681	ggggcgaggag	gtgttacctg	ccaactcttt	tcactggggc	aaagtgtttc	tcagagaacc
19741	ttagccaaag	ctaggctgga	agatggatat	agaaggattg	gtctcaatca	gggagggaaa
19801	tgcttagaat	acagggcatt	gcccagltag	gccattacaq	gtgggagccc	aaaaagggaq
19861	tgaggggtct	agagcatgtg	ctgtctctga	gtgacccagc	taggtgggga	gcacagaggg
19921	gccacccccg	agtactcagg	agacagagga	acctagacca	ggcagagggc	tggtcccaag
19981	cagggtcacc	tgagcccatc	tcaggatggg	gacaggatga	gagggcccag	gaagactaag
20041	ccctctctct	ttctctcttc	ttctctgccc	ctaggcatta	ccacagcatg	gacgagtcca
20101	gccactacga	ctactctggt	gcagccacag	gcaagaagggt	ggccagaggc	cacaaggcca
20161	gtttctctgc	ggaggacagc	acctgtgact	tcggcaacct	cacagcgtat	gcctgaacct
20221	ctcatacca	ggttgggctg	gagagatggg	gtttggggca	tgggagcata	aggaagtggg
20281	gagccaagga	gcgaggcccc	ctgaggcccc	gcaagtggca	agcctctggc	ccactcaact
20341	ctgctcagca	tgaaggctct	ctccaccgtc	ctcaggctgc	ccactctccc	tgccagacct
20401	gttctctccc	tgccccagcc	cttttcccat	gttatccag	gtgatctgc	gtggagagga
20461	aggaataact	gcaacagctc	ggagagcaac	acgtcttatt	ggcctgtcca	cccccccata
20521	tcctctcttc	ctcagccacc	cttaaatatc	cacaaactgt	ccatctgtcc	ttgtctcttc
20581	tatccattct	gccatccatc	tcgtccctcc	cacctggcta	ttagatatct	gtctttcttc
20641	tggtccactc	agccagtggc	tttaggaagg	tgtaggacca	ctctgacag	tgccctcgag
20701	ccagggtcag	gggagaaacc	caggggaagg	tgggccagaa	actcctgaag	gtggcgctg
20761	ggtggctctg	gaaacaaagc	agcatcacag	ccgctctctc	tgcccccttc	cagggccctg
20821	agccccagct	gctatgacac	ctacaatgcg	gacatgcact	ggcagtggat	cgacataaac
20881	gacgtgcagc	ctgggaacta	catctcctaa	gtgggctctc	gggtctgggg	cttctctccc
20941	aaactctagt	tcagtgtcaa	tgcccccccg	ttcctgaagg	aaagcttcag	ctctgggctg
21001	gttccctctc	ccccagctgc	Mgagcagagg	cagcatctga	ggcatcaact	cttctctaat
21061	cttcccaagc	gaagatttag	gtctcaggct	gacatgacct	ctctttccat	aaagaaacca
21121	ggccaccctt	gccccagctg	tggtaatgcc	agaggcagtg	tgatatactg	ctctctaagt
21181	gacagaggac	cagggagagc	aagaaagact	tgagagacca	tggtgtctat	cttctgtctc
21241	tcgggacagg	cagactttgt	atcatttggg	agacagatga	gagggccctca	gtctcttcat
21301	gggacccttg	caaaagccaa	ggctcctgtg	actaagaccc	ttttagccctg	aaccctctct
21361	gctctaatgg	acactcaact	catcacctct	tccttgggtt	gagggaaaaq	tagaaaaacc
21421	tattaacaac	acacatccag	acttggtaca	tcogttagtg	ccaggttgtc	atgggccccac
21481	ctggggaagc	catgtctcag	cctctccacc	acaggtataa	aatgagtgtc	gatcatcca
21541	ccagttcatc	tggaaccact	cagaagcaga	aaagcagctc	agtaaaaggca	gagcatgcaa
21601	gccaggtttg	caggcggaag	ccttccctgc	agaaagtcaq	caggttgagga	gatgcataag
21661	gcagcggttg	ttctcagttc	cctcctgagt	gctcttcagc	aggtctcaag	cttgtctctc
21721	cagggcctgg	ggttgctcag	tatatttttt	cttttctcca	ttcatccact	caatcaaacat
21781	tgtaggaagt	ccctctgagt	tctaggcact	agacacacaa	accacataag	caatcgagtt
21841	acagctccct	gccttttggg	agtgtagcag	gatttgaag	ttgatccctt	gcactgtgtt
21901	TYagatgttc	tgcaaataaa	gctggcccta	ccctagttaa	ttcaacattt	aaaagtgtgt
21961	tatcccaaca	gtctcttttc	agacaaaaag	cacagatcat	acttgggcca	ctctctcagt
22021	gaatgttggtg	cacgtggggc	tcagagagca	gggatacagc	agggccctgca	tcagtcaact
22081	agacaggag	gcataaggaa	tgacttttag	ccctggattt	ggggagagcca	tttgatgaa
22141	ctcgtgctag	ctctcattta	ctgcattccc	tcRggcagga	ttcaacctct	ctgaccccaa
22201	atgccccatg	cggggcccac	ctggcatagg	ctctagctct	agggaaaacat	ccaatctctc
22261	gataaagggg	attagatgat	gttttcttgg	attacagctc	gcctctctct	ctccctctgt
22321	gtctctctag	cagtggtgtc	ctgttctccc	ttctctctgc	acctctctgt	cttctctctg
22381	gcctctttaa	caccttctct	ggtgagcagt	tgaggYgcaq	ccccctgac	tagactccct
22441	ttctctctgt	ttctcttctt	cctcaggtgc	acgtgaaccc	aaagtatat	gttttgaggt
22501	ctgacttca	caacaacgtg	gtgagatgca	acatttcaata	ccaggtctgc	tacgtttctg
22561	caacaaatgc	caaaaattgtc	cagtaagagt	ttgcccacca	cccttctgtg	ctccgtctct
22621	ttctctcctg	gggagcagcg	aaggccacct	gaRataacct	agataacctg	acttaggttc
22681	accttgatag	cgaaacgcag	ctgcagcagg	gcccatacaa	aaagaccttg	tcctgtccaa
22741	ccccagctgc	agtgtttacg	gtggggctca	ggcgctaggg	tgttgatctg	gggctgcctc
22801	ctgtgctccc	ctgagatgtc	ccaagtgaaa	accagagcaa	gcagagatca	tttgatgcga
22861	ggccatgagc	cttcagctgc	cagttccaca	gcttctctgc	tatgtgacat	tggttacttt
22921	ccttgagctca	ctttctctcaa	ctataaaaa	ggtattttcca	ctaggctggt	catgagagat

22981 ctacaggcct gatgtctgca tgttccacagt ggcacacagat gaacagcagtc tgtgtatcatt
23041 agtgttcttt tcaagtggac tggattaaac agtcacagat tgaagtgat tctgtgttcaa
23101 aggagccctc ttcagttccct aggcceccat tgtagaagaa gtgccttaaaa tctgtggcttg
23161 ggtatttgct acatgctgct gggtagggctc tctagctctt cctctgtgat cccatgtgaa
23221 tgaatttgca gagggacccc ttgcttcaaa gctcacaagg aaaccccacg acactcccaga
23281 tgcagtgcaac ccttttccat taataaaaaa agctctagag tcttcaagct
23341 tagtttcaata actggggagaa aggtggtaga gatcttlaag cccagagagg tatctttccc
23401 taaaagtgtg tacttattaa tggatggcag gatagagaga ttaagcctat gacatgtgct
23461 aggtgtctggt gtagggccag ggtcaggatt cagctctgta caaggggttag ggctcagatc
23521 gtgacaagggt ttaggactca atgtgtgacc aggtacaagg ctacgttgtg gccacagggt
23581 aggtgtccagt gtataccatg ggtcagggcc cagtggtgta ccagggtcag ggctcagctc
23641 gtgaccacag tcagggccca gtgtgtagcc aggtcagggt ctacgttgtg gccacaggatc
23701 aggtgtccagt gtgtgaccag gatcagggct tagtggtgtg ccagggtcag ggctcagctc
23761 gtgaccacag ccaggctcat ttagagacag cctctcaca cttggttgtc accatcaacc
23821 taactgttca cagcatgctg ccaccacatc atgaataltt aaaatgggaa cagcagcttc
23881 cagttccagt cagagattag gtctctcatg agtagaatga gatcagaatt ccacagggga
23941 cacagcatgt ttgaaaggac gaactcctgt cccatcaact gcatgttggt tctttagcag
24001 gctctgggttt ccagcacatt cctgctctctc agggcctgtc tttagccattc aagaccagg
24061 gtcacctaaa tggtagaagg catctctagg aaaggaggag aaggaagaag cgtgtatcca
24121 ggaaacaaag gaggctgctg ggggctcggg gaggcaggga atccctctgt gctgtgggtc
24181 agggggatgt gaacagaaac agcatcccac gtgccaggcg ccttgagacag ccaggggctg
24241 tgtcgcagg gcagatggag aagcagcctg cgcggccctc ccagctcccc ggtagggctg
24301 gggcagcagg gggagccaaa gcccttctct ccaagagctc tttacataag tgccttgaaa
24361 ggcggcgctg tattagagt tctcagttct tgtgacctg agcagagca accgaggtg
24421 ccagcgtgca caggaaagctg gacagagcgt tcccagaaag gccacgggac tgacgcctgt
24481 gggtttccat cgtgtttctg gaggaaaaag gaggccttaa aaaaaaaaag tactgagtta
24541 gaaaaacaa gaaagtattt ccagacagta gcagctctgc taatgggcta gaaacaactc
24601 tgggtgactag ggtaggggag gggaaatgtg tgagactgt ccttggggtg gttggagctc
24661 atcaaacccc tctttttgga gctgggctga ggggctcggg actttctctt gagggaaatg
24721 tagggccatg cctgccctgc cagcagggat ccttccccct ccttggtgtg gctgcagtg
24781 gaggccacgg gggcctactt tgcagccctc cattgaccca ctgtctttcc tctctcagat
24841 cctgatctcc gtaggggaca gatggccaat ctctccccct ccaagacagg cctctgcctc
24901 cgggcagcct cccgccaggg ggcccagccc ccaaccacca ggca3ggaggt ggcatcccc
24961 cctggcgccc tcagggagcg aacgtggatg aaaaaccacag gatttccgga Ygccagacct
25021 catttataac ttacattttt tctacagtgt tgttttgttg ttgttgtgtt ttatttttta
25081 tactttggcc ataccacaga gctagattgc ccaggctcgg gctgaataaa acaaggtttt
25141 tctactctgt ggctctgcat gcggcctgct ggctggctgg ccagccacag ctagtgtggg
25201 cctgggggat gtcttaggc atcatccttc ccttcgcca atgtggaaag ggagcctacc
25261 acccggtcag gaccacagtg accatgagg cgctgagccc atcgtggaag cctgtgggtg
25321 tgagcccttg gccaaagcctg tcgcatggga atgggaccac atcgactag gggaggggccc
25381 tgacagcggg tggcgccgac cagcctgctc tccctgctca gccctctgct ctatctgggc
25441 cgtgtgccc actgctgccc ctctcagcc ttacgctca cactcccacc gtgtcccctc
25501 ctggccctct cactctcaca cgttcaact tccaccagcc acccaactcc ttcaaatgtc
25561 aggcctccga actcaagtct cctgaaggcc aggtgtgtg ctagggctca ctagagagca
25621 tctgactctc tgccctcagg gagcgataa ccacagggaa cggggagcac cgttgcacca
25681 gtgagcagc acctaggggt tctggggagc ctctacatgg gagagagcct ccttcaggc
25741 agggagggga gaagaggatt cttggcagag agacagatt gagcagagat catgaggtg
25801 ggctgcagcg cgacagggtg tgaagtggag atggaggag gccccgacg cccagcacc
25861 ccgtccccgt ccttggtctg ggcatccag aggtcctgga cactggaatg gaccaggaag
25921 aagtgagagg gtggtgcctc tctctctcga gccctcgaa acagagccct cgggatgtc
25981 ccagaccacc ctgcttccct gtgggggcaa caccagtgaag aaagggaaag agactttgtc
26041 caagtaccag ggctctgggt tccagggccca atctctccta ctgctgtgtg ctgtgtggga
26101 agtcagactt catctccggg cctcagtttc ctcatgata agalgggaat gccctctgc
26161 ctggctccca cactgacatg gagagttgat gagctactgc tgacggggag tgcgggggag
26221 agctcacagg tgtcagcacc caccctccca gatcttgtg agcccaggcg atcttgaga
26281 ggtcctccaa gaaggtgtcc cctgcttttg gctctgatgc tctctgtgcc cagggttccc
26341 tggtagcaag gagggtttct ggtgcatgag agagggagg cttctttgag ccatgctatg
26401 catccaggag ggttctggcc cagtcctctg gagcccttgg gccactcacc agcccaggca
26461 cagggttgga gtgggtgtggt ctgagccct cctcgccccc tctctctgca ggctctggct
26521 ggaattaaact ctgctgacag ggttagtgcc cgactctgc cactctccct ctggagctg
26581 accagagagg gtgagaggag tacaggcaca tgcctgtcat ccagggtctg catctctgtc
26641 catccctcg cgggtgtgtc ttccaaagat gctgtcctta ctagagcccc accccctctg
26701 ctctctagat actcccagga gtgaagcttg gagggggtca gacaaggtca accaatccca
26761 gactgtcagg aggcccgat gagtgagaga gatttctcag ctcaagaaac

26821 tgaagccctgt ctgagaccac aggcgaagttc aaggcagaca cagtgtctgga gctcacgtct
26881 ctaagcccta ggcacgggcc aaatgccggg tgtgtgcagt ttctgtggga gatctgtggg
26941 cttcagcagat gagcttatggc cctgaacaca gaatttgatg gaaggagaga gtaagggttg
27001 ctttcccaaa aagccacacac atcacaaagt gtggggaggt gggagacaca caagagact
27061 ccagacagaca gtgctcccg cgtgccatga acctttggcc tgaagtccag attctagagg
27121 ggctgggtgga gtccccaa cctgccatca gagtggagac acctgggcca gctctcacat
27181 cgtgggagga ctctgagatt agatctctgg ggaggggctt cagatagccc ttgtccccc
27241 aaaaaacaga ggagcctttc acccaaaaga gaagagagat agagagaaga gtagagaagc
27301 agcgtgtgagc cgcaggagacc agggcagccc tcaccgcttc ctggctgacc ttgcagggcc
27361 ctatcaatgc agcttcacgg cactgcccag cagtgcagcc cctcgggacc agcagatgca
27421 gctgctccca cctcaggggg cagggtttcc tcaagttatt tgaactccatg tagaatggca
27481 gagtctccct gagaatgggg agagaaaaac tgcacgacg cctcgggccc agcaggcgct
27541 gagctgagga gggcggtctg gagaggagt cctcccagc tcggcctcag cctcttgagg
27601 tctgtctggc gtgactgca tggaggaaaca gctgtctgt tctttgtct tgcgtcacc
27661 tggctcgggc cctccctag atagagctca cctgttgggc tcacccccc aagccagccc
27721 cagggagggg tgtgtgaggg ccactggagg ccaggtcacg cagggggccc actcaggccc
27781 agctgtccct tcacccctcc gtttgccttc caagggcag ctgaaacccc gattttctga
27841 agcttccctt aacatcccc tctccccttc aactggggtg cagtgtgtgg cctcattccg
27901 gactctccca cccccacct gccacggaca cacaggggca tgggagagg caccocagcc
27961 ttgatgtctg gacaaaggtt acataggtgc catctcagcc aggtgcagtg gctcacgct
28021 gtaattccag cgtgtggga ggtcgaggcg ggcagatcac ttggggctag gacttcgaga
28081 ccaactggcc aacacggcaa aacccatct ctgctaaaaa tacaanaatt aggtccagc
28141 ggtggcagcg gctgtaatc caagctattc gggaggctga ggcaggagaa tgccttgaac
28201 ccaggagggg aaggttgca gtagccaaaga ttgtgctcac gcactccagc ttggcgcta
28261 gagtgaagct ctacctcaaa aaaaaaaaaa aaagaaaaag aaaaacaaaa gacaaaaaaa
28321 accataggtg ccatctccac tctgaccca gcacctctt tctggctgca cagaccaaga
28381 gggctctctg tggtaactg ggcactgggt tgcaggaatc caactgggtg taaggggct
28441 caagtcaact gccacgcat cctcccctgc ctcttctgc tcagcccgag ggtcgggag
28501 ctcaactgct ctcgagacat ttgctgttag aaacacctg agtgaataa gacccccacc
28561 cctYtcccccg cagccttccc ttgggctggg tggggctggg gacagcagag gcgacacct
28621 tggatgtgac tggcagcag gaaggacaga gacagcagag gcgacacctg ccagggggca
28681 cagctgtggc cctgactctg tcttcaagt ggctcagtg tccctatctg tctgagggg
28741 cgtgagtgct ttgctagtcc ttacctgcca gagaagaagg ggcaggggaa gagaagagag
28801 gggggggagg aaatgggagg tagaaggagg ctgggtaggg agtgataggc aaagtcacag
28861 ctgggggaag gtgggcaagc agcaggggga ctggcctcaga aggggagcag ggaagccaga
28921 gaggcactgc tagggctgca gctgtgtgag ggctggggcg gctgtggcg ctaggattgc
28981 cacagagaga ggcctgaagt gggggtactg gacctcaaac cagggctggc ctgaacccct
29041 tggaaaggcc tgctaataga gacagaggtg cctgtggccc ttggcagggc gtggctggc
29101 ctgaaagcca gccacagact gacccctctg cggcctacca tcttgccac agccttgacc
29161 tctcccctcc cctgcacct cagatgccca caccocctgt gcaattacat gtgcgctccc
29221 acccaggcca gcagccccct gcaggggagg cccaggctaa aatccccccc attctgttgc
29281 cctccctccc actagaatcc cactgttttt gagaagttgg caggcgctgt gttgggaa
29341 cactgtataa ccaactgag aatgggtggc ctgggtccat gctcctgtcc gcttttagat
29401 gaagagcttc ttcatcctca aaaaaaatga ctcaagaag agccctttaa tagactgtc
29461 gggtaggggt ggagggtctg taaggatatt tacagatctc tgaaaaaaga gctccagca
29521 ttaaccctgt aagagagctg gcgcctgggc cccaactcct taccacactg gactccctc
29581 tctgactggg aggcctctga gctgactcc gcgcaccca cgtcgccca caagccaaag
29641 ctctctctga tgccccctga ggtcgtggc attggcgacc gctccactg gacactttg
29701 ggtggggggg attaccgctt tccctactta ctccagcct ggttagggg cccatttccc
29761 agtctctgcc aggtctccca cccatttggt gccaaggcaa gagagaccac accccctga
29821 attctcaggc ctactagtccc tgcgggtac tcatacagat gggccctccc cagcaattcc
29881 taccacggc tgcgtccgga tccacaacac aaccacagca ttgttgaaa gacactgac
29941 acctccctgc aacttcccc cgcactcccc agactgagtc atgcaggcg tggccctggg
30001 cagacgtggc cagggttggc accagctggc cagagagaat gagaggcact gaccacggg
30061 aggaacctgc ctaaaagcca tgcataaagg ctaggagagc agccagatgc tgggaccaa
30121 gggctcctgt gacacacacc accctgaaag ttgcactgca gctttctga gaaggagtc
30181 agagttctgt aaaaagcttta acgacaaaac tcaacatctg gaaggagagc gaagcaggtg
30241 aggtacttgg tctccttcta tgtgaaatag ctttaaaaaa aacttttca aaatcagtt
30301 taatattgctg tgagccccct ggcctaccag tgggaaagt aagaactctga atcatttct
30361 cccacactag acacttgaa cttcagaact tcagagagag gctcgtggg ctttagctct
30421 cctggtcacc gctcctggc tgattcact tccctcagg cggtgtctc cactctctg
30481 aagacttggc cacatggga gccatgtccc tcgaggttc ccaactcccc aggcactgc
30541 caggagggcag tgtcctcgtt actagcagag ccagagccac caccacaacc atgcacca
30601 cctcccagc cagggaact cctccagct cctctctgc cttcttcta

30661 actactcact ctttctctct tcctctctgg gccaaccttc catcatccct gccatgtgcc
 30721 ttggttcaag gaatcagctt tggattctgg cccttaagat ggagagtcac aagtaacctcc
 30781 taggaatgag aaagaggaaa agacctagca ggggaatgcc aataatatta acgacctca
 30841 ctaatttctt caaccttag ccatgggcca ggcctgctc taagtctctc atgaaggta
 30901 agcccatatta atcctcacaa gaactctatg agggagacac tgcatacccc atttttgtga
 30961 tggacaaact gaggcacaga gaagtcatgt gaactgccct agttccctga cctagtgtaa
 31021 ggggagagcca gaattccaac acaggcacat ttctggagac agggcagtag ttctccaga
 31081 tcttcaaaag caatgtgggac caggaaagaa gccataggtc ttgtctctga aacatggcaa
 31141 gaacacttgtt caaacctatcc catcatctcc ttctccaccg agtctctctag aatcatgtgt
 31201 ggctcctgga aaccgcagct tgaaaaggat tggtagaag ccttaattct cctagaagat
 31261 gtgtggtagt gtaattcaga cttagattgt tctttatggg tgagagagag ggcaaatatc
 31321 aatagataaa ctggctgggt gccgtggctc atgctgttaa ttctcagact ttgggaacct
 31381 gagggtgggt gatcgtttga gcccaggagt ctgagatcag cctgggaacc atgttgaac
 31441 cctgtctcta caaaatcac aaaaattagc ggggcttggt ggtgcacccc tatgtctca
 31501 gctatctggg aggcctgaggt gggaggatgt cltgagctca ggaagtggag ttctcagatg
 31561 gttgagattg tgctgccgta ctccagcctg ggcaacagag tgaagccctg ctgtgaacct
 31621 aataataaa atcatcggtc agtcaacaaa atattaatag aaaaattagg gattagaag
 31681 gataagaaca cagccatgga gatgactttt gaaattgaa aactatgtgc atgtctaatg
 31741 attgaggtgt cccaacatta aataataatt ttctagtatt tctaaattgc caaaattgac
 31801 tccagtgaaa agcacaaaaa gaccaattac cacagaagaa aatttaaaaa ttatcatctc
 31861 taagaaagacc acagccctca gggagtttta gcatgagtta ttccaaactc gaagaacagt
 31921 gaatttctgt gttatgtaaa ctctccaga gcatatgggg aaaaatgtga atgtatttta
 31981 tgcttctgaa ttgattttat taagctaact ctaacccaaa actctgtata agatttgcata
 32041 cctcgcccaac ccacctcac gctgataacc acagaccaat ttactctctg cctgtgata
 32101 cagaagtctc ggataaaatg ccaccagtg gaaacctgtac cattgttaata ccagattgcag
 32161 cctcgccctc gcatgctttc cctccacca gatgtgtgct agggcacaac tgcgaacctga
 32221 tatctgggtc caggcaattt ggacacaaca ttcaactctg tggctcttag cgcctctctc
 32281 caggaagcaa agagtaaaat gaagcaggtg tccaaagctt gaaaatgtga actgaaggtca
 32341 cagcttgatg tactgctgtt gactggcaac atagttaacc acaattatct gttagagtg
 32401 tcatctcata ttctcttttt ttgtttgttt tgagactgag tctctctctg ctgccaggtc
 32461 agagtgcagt ggcgtctgtc cgactcagtg caacctccat ctcccggtt caagcaactc
 32521 tctgcctca gcctctgag tagctgggac tacaggtgcc tctgctgcat gtcgactaat
 32581 ttttttattt ttatagaga tggggcttca catgtgtggc caggctgttc tcaactctct
 32641 gacctcaaat gatccactgc cctcgccctc ccaaggtgct ggaattacag gtgtgactcc
 32701 tcatgcccg ctgtattatc ttttctctgc tgagaagtct ttaagtattt ttgtgtctt
 32761 ttttctttt tatgttaggt ggctaccttc tctacctttt cctgcagagg ttgtataaca
 32821 tgattgaata agcaagctct aataaatgcc ctctttgtct tatcaactg cataccctgc
 32881 aaaaactggg aaacagtgcc tgtcgtgcc tggaacccg aatcctgggc ccaagggaca
 32941 tgatccagct ggtagtgcgc ctgtgccagg tgagaaaaag agaccttgc ctctgtgga
 33001 gttgcagcag cctgggagct tctcagccag ggaacagatc atgtctgcag ctggaggaca
 33061 cctcatctca gatattgtac atcagagccc atctcatctc tgattcacag ccatgtcccc
 33121 tctcaacttc tcaaaaaaat tcaagtatat taagaaatac atattttttt gacagcagat
 33181 ctcaactctg cgccagggtc ggaagtgcaga tcatgtctca ctgcagctc gacctctgt
 33241 ggtcaggca atctccccc ctacagctcc caagtgctg gaactagatc gactgtcac
 33301 catgcctggc taattttatt tattttatt ttgtatttt ttgcggagac agggttctgc
 33361 catgtgtgcc agtctgtct caaactctg agtcaagtga atctctgc ctctgcctcc
 33421 caaaatgtgt ggattacag catgagccac agtgtctggc aaagaaataa tctgcataca
 33481 gcaaaaattg ccttttttag gtgaacagtt tgatgagtt ttgacaaatt atgcagtat
 33541 ataaatcccc ccacagtga gatgtaatc ctccatcact caggacttcc ctctgtctc
 33601 ttgtgtcccc gttttctacc tcccactcc agccccgcg aagccactaa cttgtttctg
 33661 ttctgtagt ttgtctttt ccagaatctc aaatatgttg aaccacatag tatgtggct
 33721 tctatatctg gctgtctca cttaacata ttgtttttt attttaatt taattttatt
 33781 tattttatt ttgactgag tctcaattg ttgcccaggc ttggaatgag atgtgtgct
 33841 ttgtctcct gcaacctccg cctgccaggt ctccctgtc tctctgtc agctcccaat
 33901 gtatgtggga ttacaggcac acaccacat gctgtgctaa ttttttat ttatttagta
 33961 ggcgggggtt gccatgctg gccagttctg tctccaaatc ctgactctgt gatctgtcag
 34021 ccttggcctc tcaaaagtct aggatcacg gcaggagcca ccgtgccag cctatttttc
 34081 atttttga gaactctacc ctgttgcca gcttggtca atcttctac ctctagctc
 34141 actgcaacct ctgtctcccc ggttcaaaag atctctctac ctctagctcc tagtagtgat
 34201 agattacaggt tgcccaccac cagcctctgc gtgactccgc caccctgggc taacagagt
 34261 ttctccaggt ttgcagggtc ggtctctcaa gtgactccgc cactctgggc tcaaaagac
 34321 tgggat tga ggcattgggc tctgcaactc attttttaac atttttacg atagattga
 34381 aataacaggt tttatctatg gatgatgag tgatgttatg atgtattat atgtattga
 34441 ataatcaac tgagctaat aacatacca tcaactcaaa tactttctt attttttga

34501 gtaagaacat ttggaattta ttctgttgat aattttgaaa tgtacattat ttaagatatt
 34561 tgaccagggg tgggtggcaca ttccgtgtaat ccaaacactt tgggaggcca aggcaggcgg
 34621 atcactctgag ctacaggagtt caagcaccag ctgggcaaca tggtagaaca ctgtctctac
 34681 aaaaaaacaca acaattagct agggatgggt gtgggcaact gtagctccagc agaatgaga
 34741 ggcagagctg gggaggtcac ctgagcccag gaggttgagg ctgtagttaa ttatggtcta
 34801 gccctctgac tccaacttgg gtgacagagg gagatcttgt ctgaaaaaca aaacaaaaaa
 34861 caaagtgtct acatgctcac gagacacatt atatcctctt tttttttttt tttttttttt
 34921 tttttttttt tttttttttt ttgagcaggag tctcactctg ttgcccagct ttgtgtacag
 34981 ggtgcaattct cggctcagtg caactctctg cccctgggtt caagcgatct tccctgccta
 35041 gcttcacaag tagctaggac tacagacacg tgcacacaca cctgcctagt ttgtgtatg
 35101 tttagtagaca cagggtttcca ccatgttggc caggatggtc tcaactctct gacctgtgga
 35161 tccgcctgcc tcaactcccc aaaaatgctgg gattacaggc atgagccact gtgctggccc
 35221 tgtatcctct ttttaaaagg catctctaga ggtatcctgt ggcagtcact ttcccatatt
 35281 cctggggact gattccaggga ctccgaaaa taggaaaccc cgggcagctc acttctccct
 35341 atataaaaat gtgcagcgtt tgcataaac ccaggcacat aacccgctct actttaatt
 35401 atctctagat tacttatgat cctaataata atttaaatgc tatgtaaaat gttgtatgc
 35461 tgtattgttt ttaatttgat tgtttttatt gttgtattgt tatttttttt aatatatttt
 35521 atctgtgtgt tcaactgtgca gttggttgaa tccgtgggat ttattttttt agactaccgag
 35581 gctgactgtt atttcaattct gggttaaaatt ttcatllccc tagttagctaa caatgttgag
 35641 cagctgttcca tgggtgtgtt tggcaggata tctctctctt gtagaaattc gtgcttagat
 35701 cctttggcca ttttttaattg gcttgtttgt ctcatattgt agttggaaga cttctttatc
 35761 tattctctgat acaagtattt catcagtgat atgttttgca aatatattttt occaatctgt
 35821 cgtttgtctt ctcaatttttt actagtacct tcaaaagagc ggaagttttt aattttgata
 35881 agagccaatt tctcgttttt ttttcccttt atgggctgtg atttttgttc ttcttaactc
 35941 ttaacttaaa caatgtcaca aagattttct gtaagcactg caataaaagt tatcccatga
 36001 gtttttagga tcaagtctca atttttgatt ttgcccacaa tcttatctaa ggaacttagg
 36061 gagtctgcc ctacaaatcc taaattctca tcagatgggt tttatttata tatgtgact
 36121 tacttttcaa tctgactctg gtataacatt acgagacaag gaataaaatc ttatccatgc
 36181 aatatatttt cctgccatag ctgaaattgt cctgcgaat ccttctgtgg aaaaatccac
 36241 attctataga gaatccccct gcccttttgt ttctctctct tcttttccag atccaggagc
 36301 taatcactca agagccaggc actcttttag gtctaataag aaacatttga caactctgtc
 36361 tctctctact cctctgtctga agtctgctat ctgagagatt cctcttgaca ataaaactgt
 36421 gtttccacaa tctctttattt taacctgaac atttctctt tatgtatccc agatctccc
 36481 acaaaactcaa ccaattgtca accagaaaaa gtttaaatc actctatagg tggaaatcag
 36541 cactttgagt tgtccctctc ttctgaacca aaccaatgta tttcttaaat cttgggcaca
 36601 gatgtctcat gcttccataa atataaaaa ctaagctgca ccccgaccat ctgggcaca
 36661 tgttcacatg ttctcaggag ctctggaggg ctgtgtccag ggcactgtgc actcatattt
 36721 ggcttagaat aaatctccta aatatattta cagagtgcga cctttttcat cgacatgtt
 36781 gatagtgtt attttttatt ccattagaat atttctaatt atctcatgg ttctctcttt
 36841 gaaccataag ttactcaaaa gtgtgtgttt tgatttccaa acattttggg actttccaga
 36901 tactttctgt ttactgattt atagtttaat ttcatattgg tgagaaaaaa tactttgtat
 36961 gatttcaatt atttttaatt ttttaagatt gtgttaaggg cccagaaat taatttttgt
 37021 gctaaagtgc catgggact caaaaagaa gtgtattctg ctgtttgtgt gcgaaatgtc
 37081 ctataaaagt caatcagatt gtgtgttatt agtgttatt aagtaacca taacacagct
 37141 gattttctgt gtactcgctc taaccaatat tgagagaaga gtgtgtgtgt ctattttccc
 37201 ttccagctct aacggctctg attgcatgta ctgactgtc atgtctcagat gcacatgat
 37261 ggacagttaa gatgtcctct tgatgaatca accctttat atacagctct tctttattcc
 37321 tggaaatatt cctctgtttc gcttcaactg acattaatat agacacttga gcttctcttg
 37381 gattagtgtt tgcattggcat gccctttttc catctctttg gttttaggct atctaggatc
 37441 ttattattat tttttatttc ttttgagaca gagtctcgct ctgttgccca ggtctaagtg
 37501 caatggcctg atctcagctc actgcaacct ccaactcccg agt tcaaggct atctctgtg
 37561 ctggcctccc caagtgggtg ggtattacagg ggtattacag caatctgcag ccatctgcag
 37621 atttttagta gagatggggt ttaccatgt tggccaggct ggtctcgac ggtctcgac
 37681 aggagatcag ccgccttagg ctcccaaa gtctgggatt acaggtgtga acagctgccc
 37741 cagccctagg tttttatatt taaagtgtgt ttctcacaga cagcctgagg gtcccgaaa
 37801 ttttctggaa ttgtcgcgctc caacctcagc tctcagcaac cctctgtgtg ctgcaactacc
 37861 tggggatgac gtggtcttgc cctcctcctg gtggtaaatg tctctgtgtg ctctgtcccg
 37921 cccctgtgtg tgaattgccg ttgctgtcac tcttggttgg tcttagtagt gaggcagctt
 37981 gtggacgtgt gttaaaggggt ttcggcaggg tgggatgttg ctccattctc ctggccagc
 38041 ctccgacagc cctgtgtaet agggctcag aaggtggagt tctcgaagt ctctgtccc
 38101 tctgtctgt ccttctatct cctgtgggtt taacacagga gagtgcgtcc tgcgctccc
 38161 acaggggcaa gtggtgttta ctttgatct gccccagaa gctgtgtgtc tggcttctgc
 38221 ctctcccgca gcagccctg ggcagagag tgcagctccc caagtgttt gtccagaga
 38281 gaatcgtctc ggggaagcag gtgggggtcg ctgcacaga gtcacatccc gcttgagtc

```

38341 ttgtgccacc agcaaggggg aggggtctct cccggctccc cctctgctcc cagctctttt
38401 cctcgatgga aggcctgtgc aaaaagctca gaagcgaggg cagactcctc cctgccccc
38461 acatgtctctg cccaagacag ttggtcttgc ctctccttgg aggtcttttg caacttttgg
38521 aattcaggttc tctgtgttgc ctgccacctc agctaactga ctgtgtttaa aattatgtgt
38581 ttgtgcaatt atctggtgtt ttgttattgt tagagctggg ggccgggggt gtcttctcct
38641 gtactcccaag cacttctggg ggtgaggtgg ttggacctt ttgaccttgg atctcaagac
38701 cagccagccct gagcaacatg gggaacccct gtctctacaa agcaaaaaaa aaaaaaaaaa
38761 aaaaaaat tag ccagacatgg cgacaggagc ctgtagtccc agtaactcag gaagctgag
38821 tgggatgtact actggagccc cccagaaaaa gaatgggaat gatgttcccc tgggtttgtt
38881 ctatctacta agaggaataa aaacactctt ctcttctact tttaacatag ctcaattgatg
38941 gactctaaat gccttctagg gcaatgtctc atggcttaca gtgcctgtgt gttttctca
39001 ttcttctcat gattgcaagt gtatttgcta ccaattgtgc agctgaacat tccaagccc
39061 ttacttgttt ccagcatgct ttcatttaga accatccctg actcctcttt tctctcaaac
39121 ccacggttcaa ttgtcagat aatcctgttg gcccatggtt caaaataata cccatctctt
39181 tcaaaaaataa aaatggactt atcataaaac ccggcaattg cactgtcatc aattttccc
39241 agagaaatga aaacttattt tcatggttga actgtacac aaatgttcat gaagctttta
39301 tttataatgg ccttaaacca gaaaaactc acaaatatgt gtaatatcat accacagat
39361 actattctgc tttagaagga atgaactatt ggtacaagca acaacttggg tggacttttg
39421 ctgagtgaaa aagccagcct caaaaagata catcactgca tgattctatt tacacggcaa
39481 ataatataat tagagagga atagactagt ggtgtcagg agttaggaat gtgttagatg
39541 ccgttctctct ctttctataa agaaaactct gagactgggt aatttataaa ctaaaaaggt
39601 ttaattggct cactggttctg cagtctgtac aggaacgctg gtggcttcag ctctggggga
39661 ggcctcaggg aacttacaac catggggagg gcaaaaggag aggcaggcac cacttacatg
39721 gccagagcag gaggaaaaga gatgggaggt gctacacact ttgaaacat tagactctat
39781 ggtgtcattc cattcatgag aactccaccc ggtttggtgg ggaccagat cagtaccata
39841 tcagaaggta ggggaggggt tggctgtaaa ggggttacc gaggagcttt gtgtgtatg
39901 tacagttgag cactcggctc atctcgttgg ctactccagg ctacacatag ggcaatttta
39961 catagagctca ctttgtggtt ggcctgggtgc gacggctcac atctgtaat cccagcactt
40021 gggaggtcga ggtggggggg tgacgaggtc aggaagtgca gaccaacctg gccaaacagg
40081 tgaaaccccg tctctactaa aaatacaaaa attagccggg tgtgctcagtg tccaactcga
40141 atccccagcta ctacaggagg ctgaggcagaa gaattgcttt aaccggggag gtaggggttg
40201 cagtgagcca agattgtgcc actgcacttc agcctgaaaa cagggtgaga ctctgtctca
40261 aaaaaaaaaa aaaaaaaaag ctttttttgt gtcttgtgtc tgatacggta taagtggat
40321 catttccaac accaatcgat ttctcgtctc tgtataacca attgccgttt caataattca
40381 attctattct gatactaac ttgagttagt gtacagctcc acaggtctga gggctcagtc
40441 ccataagact acccccattt ctcccaggcg cagtggctca cactgtaat cccagacatt
40501 tgggaggtct agggggggcg atcacctgag gtcaaggatt cgagaccagc ctggccaaca
40561 tgggtaaaacc ctgtctctac taaaaaatac aaaaattagcc aggcctggtg cggggcacct
40621 tgaatccagc ctactcggga ggctgaggca gaagaattgc ttgaaccagg gaggtgagg
40681 ttgcagttag ctgaggtcac gccattgca cccagcctgg gcaacaagag tgaactcca
40741 tctcaaaaaa aaaaaaaatg gctgggtgtg gtgctcatg cctgtatacc cagaactttg
40801 ggaagccagg caggcgagat cactcagagt caggagttcg agtccagctg gggccaactg
40861 gtgaaacctc atctctacta aaagtacaaa aattagccag gagtgggtgg cagtgctgtg
40921 aatcccgact acttgggggg ctgagacagg gcttgggtga gacccctgca gagggtgtg
40981 tgtgagccga gatcgtgcca ctgcactcca gcttgggtga ccaatgtgca ctcgtactc
41041 caaaaaaaac aaaaaaaaac aaaaacaaaac taccctcat tcaactgca ttcaaatgca
41101 ctgggtcccc aggttaccaca cacttctgtc agaatggctc acaaatgtga ggttccctg
41161 acttccattc ctcaggtttg ataatttgct ataatgtctc acagaactca aaaaaacaca
41221 ttaactcacc atctactgct tattgtaaaa gatacaactc aggaacagcc aagtgaagag
41281 atgcatacga ctgggtattg tagggttgggt gtgcagagcc tccctgctgt attggtgctg
41341 cacccttcca gcatctccat gtgttccaac ccagaagctc tccaactccc atgttttgg
41401 aactttagta aggttccatt acagaggcat gatttgatga atcatgtgtc atgttttgg
41461 gaactctcat cctagccact gtccactccc tggaggtcag agagtggagg tgaagtctcc
41521 aactctctca tcatcaatca tggcttagtc ttctgatca gacgctgta tccaagaact
41581 attttagggt ctcattaaca taagctcagg tatggttgaa aggggtttgt tctgaalaac
41641 aaaaactcac gtaactcag gaaattttag gagggtttta aaagattctg catgaagacc
41701 aggggacaaag gccaaactca tttttctcac tatatacatg atttccccat tctcaactga
41761 acacacaaaac acacacaaa atgggtgcgt gataactgta tttagactga atctggttta
41821 tggatgtgic cgtatgtcca ttctctgctt ttctcatgct ccttgtgtac ctctctgtac
41881 tctcatgaga gtaggggaac atgggaactc tctcatgctt ccttgtgtac ctctctgtac
41941 cctacaattt tttcaaaatt aacaacttag aatacaata acacagagtc accctcccgc
42001 ctgctaccag cctggtccac accactctct ttcttgcct ggaattatgc aacccgcgt
42061 tttttttttt tttttttttt tttttttttt ttttttttga gatggagctt tgaagcagt
42121 ttttaatggg tctgctttta catacaactc atttctcaat aagcagctc gtaagacaga

```

42181 tcttaccatt tgtagaaata aacaaaaacc attcagagct tgcgttagca aggtttgtcag
42241 ccagcactcac ttgcatTTTT gtagggactc aaaaaccaggc tgagcccttat tgcgtgtggg
42301 ccgggggtgag ggggtgcccga aaggaggtggt ggggaagcctt ggggtgtgcc ctgattggag
42361 gctattggcc tggagaagct ggggtgggata atttggagggt gattctgaga ttgctgtggg
42421 aggggtgggt gcatatttgg ctttctcttg ctggccctcaa tggggaagct ggggcaaaaa
42481 ttagggaagc tgccagtttt taatcaagtc ctggcccttc ggggtgctatt tttagaagaag
42541 ttatttgttt gcttctctgga tggcactgg agatagtgat ctggcttctt tcatgtctga
42601 ctctatagctt accgtgcatcc tgggctgtgg attccagatg aggggggttg ttctctgggc
42661 agcttctgctc aggttaggctc cagagttcta gtttccagat ggttctggcca tgggtgcacat
42721 gttgtctcag tccctcatgt tctctgctt agaaccctgc aggggctccc attgacccat
42781 gccctctctg tggcctacca gggcctacat gagctggccc catttccctt ctggccttgt
42841 ctctctgccac tctctccctt ctctccatcc cagccacaat agggccttgt ctgttctaga
42901 acatgcccag cctctcccca aggcattcat ggcctctcaa catacttgtat gctttctta
42961 ttttctctct tctctctgtt tctcactctc tctctctcta tatataata tttctatacg
43021 tacgtatata cctatattga tatacatata cacacacaca cacacacaca tatatatgt
43081 tgtgtgagac agagactcac tctgttgccc aggtctggag tgcagtgggt tggctctagc
43141 tcaactgcagc ctcaaaactcc cgggctcaag ctatctctcc acctcagcct cccaagagcg
43201 tgggattgca agcaggagtc aatgcacccc gccctcttcc tgccttttaa tgccttatgc
43261 ttatgtctag ctctcacaac tagaatgtaa attccacaag gacaggggttc ttgtgtgggt
43321 ttgtccctac tatatccttg gcaactagaa cattgccttg ccacagcat attgagtgcc
43381 caataaaaaa tggttgagtg aatcaatgag ttgtgcgta catgtgtgca gatcatactta
43441 ctaacactcta ctaactctaa ttagggtgctc agtgtttact agacactagt ctaagtgttc
43501 tcatctagta tctaattttt attctctata gctttctctat gggtaggtga catcaggcca
43561 ctctatctct aggtaaagtg gtcctcagag acatgctgaa agcccatgag ctgtctcaga
43621 acctaaaaaa atgtttaaaa cctgagaaaa gctctggctc caaatatgca aaactacaga
43681 attcatccaa ttaataaatg ttaatacaaa tgcctacaaa gttctataga ttgttaattt
43741 atgtcattaa ttctctattg gcccttttaa ttattaaatg cagtgttcat aagaatttca
43801 ttacttttga aagaatttgg tagactagat gttaaactct ctgatatctc atgtatctgt
43861 ttaaccacag gaataccatc agaaaaatgt gtcattagtg gatttcaatg ttgtacaaa
43921 atcagagagtg gctcttacac actctgtgat gtgtagcttg gtacactctt aggcataaag
43981 agtagactta ttgctcctag gctacaaaac tgtacagcac gtactgtac cgaatactgt
44041 aggcatttat aatacaataa taagtatttg tgtatctcaa ctgactcaaa catagaaaaa
44101 gcacagtaaa aatatcatat aaaaatttta aaatgtacac ctgttttagg tacttaccat
44161 gaatggagct tgcaggagct gaagtgtgctc tgggtgagtg cgtgagttag tgtgaatga
44221 atgtggaggc ctaggacaat actgtacact actgttagct ttaagagcac tgtcacttag
44281 gctactacac taagtttatt tctttggcca gggcgctgtg ttaagagcac gctcacgct
44341 gtaatccctg cactttggga gggcgaggtg ggtgaatcac ctgaggtcag gggctcagga
44401 cctgccttgt caacatgggt aaaccccatc tctactaaaa atacaaaaa tttagcaggc
44461 atgtgtgttg gcaactgtaa tcccgactac cagggagact gaggcagagc aatcacttga
44521 acctgagagg cggaggttgt agtgagccga gattgtgcca ttgcactcca gtcaggcga
44581 caagagcaaa actctgtctc aaaaaaaaag tttttcttca gtaataaatt agccttagct
44641 ttctacaact ttatgaactt taaaattttt ttaaaacttt ttgacttttt ataataaac
44701 ttagtcttaa acacaaacac attatgcagc tatacaaaaa tattttcttt ttttgtatct
44761 ttattcttca aactttttat ttttcaatta tttaattttt ttttttaaaa cttttgtccc
44821 aaaaaactag acacaaatcc acacatagc ctaaaactac ataggggtcag gaccatacat
44881 atactgtgct tgacactcta cactgtgccc tctctgaagt tctctgaagt caacaacac
44941 ctgaggagct tcacctgcta ttgcaacaat gctttttttt tttttttttt tttagagacg
45001 agtcttactc tgtgcgccag gctggagtg ctagctccc ctagctccc aagtagccg
45061 cactccaagc gttcaaggga tctccaagcc acgaggtgtt gcgctattgg cagtagccg
45121 accgctacc atgcccagc ggggtgttc gccgtattgg cccaaagtgc tgggattaca
45181 tgacctgagc tgatccacct cctctgtctc caactctccc taaaggacct gctgagcca
45241 accagcccca cgggacaatg ctttctcttg gtatgtccat ggtgttttgc caagtgtg
45301 cttcttgaaag aagtgtccgt ctttctgaaa tgcagttaga ttagctttag tgggagccg
45361 tctttcttgc gctatagatt taggaatttg ctgactccat tataactta tgggagccg
45421 atcggatcac cagcccatca ctgactgag acgtctgtat aggttaattc accataaagt
45481 aagaattcaa atgaataccc agggagggct gagaacgct aaacatacaa ctgtgtatt
45541 aattactctt agccaagtta ttccaagggc tctgtgtatt ttaattatta ggtcttaaaa
45601 accgtgctat gttatattta acgtaaaaa atagcatctg ccagatctct cagtttcttg
45661 ggaaggaact tcocaaagga tagatttaac cgtctccacc gtttctctca gctgtgagtg
45721 ttccagaatt cctcattttg cctgcccaca aggggtgtgt tgaatatcc ctgagcccg
45781 ttcgctctcc accagtttct caggtaacac ggggtgtgt tgaatatcc ctgagcccg
45841 cctgtcaagc gcacctggac tgggaaagc ctaggcaggg

46021	tccactctact	acagcagctc	actgccctgc	cccgcccttc	cccgccctgc	gaaaqcagcg
46081	ttctggaaaga	ggaacacagc	tatctcccg	gttgccacaa	gttgccacaa	gaagctcgccg
46141	ttccagctttc	tttgcgttcc	cgtcagaaaa	aaacgagagc	tctgcactag	gagccgagcg
46201	tccaggaggc	acctctggac	gccactcccc	gggtctcttc	tctctctcgg	ggtagctagg
46261	gccctcttga	gtgacctgca	tagcttttgt	gttcgggctc	ccatggggcg	cgaaagccag
46321	actggagact	tagggcttct	cttagggccac	ttttctctc	ataccccaac	tgaacagcga
46381	ggtttgggag	gaattctgaa	cgtggggcag	agtcctctgc	ccccagacaa	ctctcgagagc
46441	accttgcctc	tcttcccaag	gcacaggcac	cagcttctct	ccccagctca	gtccctgctt
46501	ctttcttcgca	cagglttctg	ctctgtcgcc	caggctggag	tgcagttggt	caatttatguc
46561	tccctcagc	ctcgacctcc	tctgtgtgag	aggtgacagc	ggcctctgag	ctctcctgct
46621	cgccgctctc	tccgctctgg	tgcccactct	ggccgcgctt	gaggagccct	tcagcccact
46681	gctgcactgt	gggagccctt	ttctgggctg	gccaaagctg	gagcccgctc	ctttagcttg
46741	cggggaggtg	tgaagggaga	gcccgggcgc	ggaacggggg	ctccgcgcgg	cacttgcgtg
46801	ccagcgcgag	ttccgggtgg	cggtgggctc	cgcgggcccc	cgagctcgag	cgccggcgccg
46861	cgccggccgc	aaagcccggg	cagtgagggt	cttagcactc	gggccagcag	ctgtctgtct
46921	cgatltctgc	ccaggcctta	gctgccttcc	cgcgggcgag	ggcltcaagc	ctcgagcctg
46981	ccatgctcga	gcttcccccc	agctccgttg	gctctctgtc	ggcccaagcc	tccgagatga
47041	gcgcgcgcgc	gtcttccatg	gagcccaact	ccatcgacca	cccagaagct	gagccagctg
47101	ggcacaagcg	cggggactgg	caggcagttc	cactctcgag	ccccctgttg	gatccactgg
47161	gtgaagcctg	ctgggtctct	gagctctgtg	gggacttggg	gaacctttat	gtctagtcaa
47221	gggattgtaa	atacacaact	cggcagttct	tatctagctc	aaagtttgtg	aaacacccaa
47281	tcagaccctc	gtgtctagct	cagggtttgt	gaatgacca	cttgacactc	gttatctacc
47341	tactctctgt	gggacttggg	gaacttttgt	gtctacactc	tgatatctaac	taattctagt
47401	gggacatgga	gaactttctg	gcctagctca	gggattgtaa	accacacaa	cgaccactgg
47461	tcaaaatgga	ccaatcagct	ctctgtaaaa	tgggccaact	ggctctctgt	aaaatggacc
47521	aatcagcagc	gtgtgggtgg	ggccagataa	gagaataaaa	gcagcctgac	gtgctctgtg
47581	agtgacaact	cgctgagggc	cagtttacct	tgccgaagct	ttgttcttct	accttcttgc
47641	ataaactctg	ttgtttgttc	ccgtttgggt	cccgcttgc	tttctagacc	gttaacactc
47701	accgcgaagt	tctgtagctt	cactcttgaa	gctagcgaga	ccacgaagcc	accgggaaga
47761	agaaaaaact	ccagacgcac	cgcttccaga	gctgttaaac	tcactggaaa	gtgtctgtgt
47821	ttcagctctg	agcccggtgag	accacagacc	gaccagttgg	aaagaattcc	gcacatactc
47881	gaacatacaa	agtaacagac	tctggatagg	ccgcgtttaa	aaactataac	acttaccagc
47941	agcatccctg	gcttcaattc	tgaagttagt	gagaccgaga	acccattaat	tcccgaaaac
48001	cactggggcc	aaactctccc	ttctcagttt	tccaaagtag	tgggactaca	tcggggagga
48061	accatgcctg	gctaattttt	tttgtatttt	tagtagagat	ggggtttcac	tgtgttaacc
48121	aagatggtct	caatctgacc	tcgtgattca	cccgccctcg	attcccaag	ctgtgggctt
48181	acaggtgtgac	gcccgcacac	ctggccacca	gttattttct	aatgtgtctg	tttccctgtt
48241	cttgccttca	taagaaaagta	attttgaaat	gaccgatccg	ttcttttgtt	tttgtttctg
48301	gtttcttccag	cttatctctg	ctgtaaaaac	tgcttctctc	gctccgctcc	atgaagacgc
48361	tcattctctgt	ttatagaagt	tagtaagtgt	gatatatcta	ttcttttgtt	ttgtctatga
48421	ttctctggct	acagcccata	taatcattgt	aatttctcat	gagactagag	tgtgataaga
48481	gtatcttttcc	ttaaaatatt	tgccctttca	tcctttgttc	ttgaaacag	ctgtggagcag
48541	ctccagagata	agcataaaag	tgaagaatgg	gccgagcgga	gtggctcag	tttgttaact
48601	cgccagcttg	ggagcccaag	gtggcagata	acgaggtcag	gagttcgacg	ccagcttgag
48661	caacatgggt	aaacctgtc	tctactaaaa	atacaaaaa	taggtgggcr	tgtgtgtgca
48721	tacatgttaat	ccagctgtct	caggagggctg	aggaggagaa	tgctatgaac	tcggggagga
48781	gaggttgcag	tgagctgaga	tcgccactgc	actccagcct	gggcaacaga	gcgaactccc
48841	atctcaaaaa	aaaaaataaa	aaagtgaag	tcgggcttgn	tgtttggagc	ccactctgag
48901	cttaacgttt	ataaccacag	gatgatggc	tgcttgccag	gggatccaac	ctctctgcta
48961	gagcccccac	ctccacatct	ggggaggaga	gaggaaacga	aggtgtgata	cgagctggca
49021	gtgatgttaat	tgatcatgcc	tacataatga	aatcgccata	aaaaccgcta	acgactgagt
49081	tcagggggtt	ccaggaaggg	tggtcttgtg	tggaaagtgt	tggttctggg	tgtaggaact
49141	tttgtatttt	aggcccttcc	agagtggtgc	ccgtttatgt	cttctatctg	cttttctgct
49201	gtactccttta	aaatatgctt	tatgataaaa	tgctlaaacg	aaagcaatgc	tttccctgat
49261	ttctgtgaggt	gctctagcaa	attaatcaaa	cccaagaaga	gggtctatgag	aatcctgatt
49321	tatagccagt	tgcccgagag	tacaggtaat	acaaactggg	ggttgttaatt	ggcactggaa
49381	gtgggggagc	gtcttgtggg	actgggatct	gacgtatctt	ccaggtatgat	agtggtggag
49441	ttgaaattaa	aaacaccacg	tgggtggccc	tgcaagaact	gctccttgct	tgtatgtggg
49501	gggtggggga	accaccacaa	tgtggtatca	gaagtgtgtt	ttcggagatc	agtagagaaa
49561	atttgagtttg	ttttctgctc	atacacagag	aaacaaaaat	actaaagagc	atacaattgt
49621	attctgtttca	gataatatag	tgggaagaa	attccactta	tagtagtacc	aaaaaggaata
49681	aagtacttaa	gaataaatgt	tgacagcata	taaaagcata	ttcaaaactt	aaagagcata
49741	caaaagacat	caaaacacac	catgttcaag	gataggaaga	ctcaatatca	taaaagtatt
49801	caattttctt	tttttttttt	tgagatggag	tctcgtctct	ttgtgggctt	gggttgagttg

49861	cagtgactca	atctcggctc	actgcaacct	ccaactcccg	gatgcaagcg	attctctctgc
49921	ctcagccctc	caagttagctg	ggactcaccg	tgactgccac	cacgcccacg	taatttttcgt
49981	atttttttag	aagcaggaggt	tttaccatgt	ttggccagaa	tggtctcfaat	ctcttaacct
50041	cgtagctcac	ctgctctcagc	ctcccacagt	gctgggatta	cagggctggg	cccacatgg
50101	tgggccaaaga	ttacaattttt	ctatgagtta	cttgacacat	ttaatataat	cccaataaag
50161	atacaaatatt	ctttttaaaa	aactcacacca	ggtYattcta	agaattcttg	aaaaaacaaa
50221	cactagctcag	ataaagcacac	tgacagtatt	ctttttaaaa	aactcacacca	ggtaatttcta
50281	aagtcttactg	aaaaaacaaa	cactagtccag	ccatggttaag	tggtctgcatt	ctgtagtccc
50341	agctactctg	gaggccaaag	taggaggatc	acttggaacc	aggaatttga	gggtcgagcta
50401	agctatagtag	acactctgtga	atagccacta	cactccagcc	tgggcaactat	agcaagactg
50461	tgctctcttaa	acaaaaaaaa	ggcagaaggt	ctttcttaag	agacataaaa	aagaattccct
50521	ccatagatga	tttaacattt	tatggcacc	caataattaa	agtggtccta	gagaatggat
50581	aaacatttagc	ccaatggaa	agagcagaaa	gccccactat	agacctcaac	acaaaaaatt
50641	catggtgttg	aaaaaagggg	gatcaatatt	ttatacttta	tactatttta	aattccaaat
50701	gagttttacaa	ttttacaagt	aaaaataaaa	agagataaca	ttaaatctctg	ttatgatctc
50761	agaaaggagg	ttttttttac	ttatgactca	aaatccagaa	gtcataaaat	atttatacaat
50821	tcaaatatcat	tttttaaatt	tcattgagaaa	acattataag	caaaagacaaa	atgcacaaaca
50881	acaaaattgg	tgaaaaattt	acagctcata	tcaaaaaatg	ctaatctccc	taatttttaa
50941	agagctccca	aatgtcaaaa	acagaaatag	aaacacacag	cactagaaaa	atgacacaaag
51001	tagataaaat	acaggtttgt	agaaaaaggag	acacatggct	cttaaacata	ttagaagactg
51061	ctcaacctca	ctcaaaaata	cacaaaagca	aatgaaaaag	ttcttaggta	attcaatggg
51121	gaaaaagata	cttttaacaa	aaagtgtctg	aacgatttga	tatcacctag	aaaaaaaagg
51181	agctcaactt	ttacttcaca	ccatatcaaa	aaatttaatt	gaaaatggat	cacaggtccag
51241	gcaaggtgtc	tcatgcctat	aattccagca	cttttgagag	ccaggcgagg	tataaaactt
51301	gagctcaggt	gtttgagacc	agcctgggca	atgtggcaaa	acccgtgttc	tacaaaaaat
51361	ataaaaattt	ccaggtttgt	gtaattgata	ccataatgc	cactatgttc	ggaggtctcg
51421	tgggggaggt	tgcttgagcc	caggaggttg	aggtcgaggt	gagccagagt	tggtcgtctg
51481	cactcagct	agggcaacgt	tgagaggtct	ctctctctct	ttttttcttc	ttctctcttc
51541	ttttaagaga	tcaggtctgt	ctgtgttgtc	caggctggcc	tcgaactctt	gggtctcaact
51601	gatccctccc	tagctctccc	agtacctggg	aaatagacca	tggtctcact	actccagcta
51661	tactaagaac	ttttaagct	caacaatatt	aatagcccat	ttcttaataa	agcaaaaatt
51721	tgaaacagata	gttcacaaaa	gaagcacagt	gcccaataag	caaatataaa	gtggctcaac
51781	attgtcagct	acacctgtta	gagtggttaa	agttttaaag	actgactata	ccgcatgttg
51841	acaggcacac	tttgaaatg	tttgacagtt	tttcaatcca	gcaattctag	gtattttacc
51901	agatgaaaaa	atatgtccaa	acaaaagact	gtacacagat	gtctggagga	gctttattta
51961	ataacccaaa	ctgaaaacta	ctcaaatgtt	catcaatgga	tgaatgaata	catgtgtgct
52021	ctatctagac	aatggaatgt	gttgccaata	caacaaacta	cagatcacaa	gaataacatg
52081	tattactctc	aaaaaccata	cagtggaggg	gaaaaagcta	gacacacaa	agtaactgtc
52141	actcatttca	ttcatatgaa	atgctagaaa	agtgaatgt	gatcagcggt	tatgaaaagg
52201	tcagtgctg	ctcaaaagct	gaggtggcaa	gcaactgacg	gaagtgcagt	ggagaacttt
52261	gtgagtggat	gggaatgttt	tgtatttgat	tgtaggggtg	ggtgtgttact	caggtgttca
52321	catgtgtcaa	agcacctcag	atgacatttt	ttattttatc	tttattttat	taatttttag
52381	attgagcttc	actctgtgtc	ccaggctaaa	gtgcagtgcc	atgatctcaa	ctcactgcaa
52441	cttccacctc	ctgggttcaa	gcaattctcc	tgctcagccc	tcaggagtag	ctgggactac
52501	agccgtgtac	caccatgcct	ggctaaattt	tgatatttta	gtagagatgt	gggttcacca
52561	tatcgctcag	gctgtgtcta	aactcctgac	ctcaggtgat	ccactcgctc	ggccctccca
52621	aaagtgtcgg	attagaggcg	caagccagcc	aaataatata	ttttaaaagg	gtgtttgttg
52681	tatgttaatt	acacctttaa	aaaatatgta	aatgtcaggg	gaagagaaa	caaaccaaac
52741	caaacctgtg	tctttgtctg	agctagaaat	ccaagactta	caaaagcaata	aaacatttga
52801	caataaacag	gctgggctag	atggctcatg	ccgtataatc	ccagagcttag	ggcgccagct
52861	ccaggtggga	ggatcactgt	agggcaggag	tttagagacca	gcttgagaa	ggccctgttc
52921	tacaaaaaaa	aaaaaaaaaa	aaaagccagg	catgtgtgatc	ctttaaagctt	gggaggttgc
52981	ggctgcaggt	agccacaact	actgcactgc	actccagcct	gggagacaga	gtgagacctc
53041	gtctcaaac	aaacaaacaa	aaaaacaaaa	aaataactga	aaataaaca	aaacaaatct
53101	actgagatac	aaattttcac	tttccagaat	gtcaaaaagc	ccaaaagttt	aatatacacag
53161	tgatttgaca	tgactatgag	aaaaaaacac	cactgacaa	ggaggtgttaa	atgtgtataa
53221	ccccagagaa	aggtattctg	gcaatattta	ctaaattata	aatgtcttat	tttagcaatt
53281	ccactctcag	gattttatct	tatagataaa	ctctaacaca	aatagcacta	gttaagggtt
53341	attcattgca	aaagtattta	aaatagcaaa	acacaaagaa	taatacaaat	gttctatcgt
53401	ccacgacag	ttgaataatt	tatgatatac	ccatactgtg	gacatctatg	taagtacata
53461	aaagcacagg	gaaaggctgt	ctgtgtgtaac	atggaaaagt	ccctcagtg	taagtgttaa
53521	tgaaaaagcg	acacttgtgt	ttctatgtga	ccatttgtat	aaaaaacaaa	caaaacccct
53581	ccagaaagat	acataatttg	attttctctg	atatattttt	ttttaaaaaa	caaaacccct
53641	aggaagaatt	accaagaaac	taatctcagg	ggatggggga	ggatctggga	aatatgtgtg

53701 gagggagaat tttcataata tgctttccta tctttttaaa tggtttagcca accaaaaattt
 53761 aaattattgvc tgggtacagt ggtccacacc tggtaatccca aggcctgtggg aggcctgtggg
 53821 gggagagatcc tgcgagcccca ggaagtccaag accagccctga ggaacataggg gagacatttctt
 53881 tatctctacca aaagagatttt taaaaattag ccggttgtgg tgcgcaaccc tgggtgtccca
 53941 gctactcagc aagctgagggc aagaggatcg tttagccccc agagtctcaag gctacagtgta
 54001 gctactgatca tgccactgca ctccagcctg ggtgatagag caagaccgtc taataaaattt
 54061 tttttaaagt cttaaaaaata agggccaggtg cgggtggctca cactataat cccagcattt
 54121 tgggagggcct aggcagggcag atcacttgag gtcaggagtt cgagaccagc ctgggtcaaca
 54181 tgggtgaaatt ccatctctac taaaaataca aaaaataacc aggtgtgggtg gtaatggccct
 54241 ataactctgg ctactcaggt gctcagggca ggagaatcac tgaatccgg gagtgagagc
 54301 ttgcagtgag ctgagattgt actgtactct aacatgggca acagagtaag actctgtttt
 54361 caaaaaaaaa taaaatactt ttcaataaca tcaaaaatac acattatata ttaatatatt
 54421 aactaggata cttaaaactat tatcattatt caccaggtta tcttgaagaa aataataata
 54481 agaagtgctc agtccggat aaggacatat ttggccacaca gtaatggtta ctatttctat
 54541 accctgcgcc tcaaatgcgc gcacacaacc tgtctggtac ttccagttct agttcccccga
 54601 agcccagttg cctgactgcc tcttccagct gtgcccttgc agggacttct actctgctga
 54661 atgattttcc ccatctcttc ttattgtcca cctacttggg agctgggagt tggagagact
 54721 cactctcca ggaagccct ctctgattga cacacaccc cctctccct cctccacagc
 54781 acccttttag tggcccttgt ccttctctcc ctgtggactg cagggtctgc tggctctctt
 54841 gtagtctgag agtctggcc aaggatcgag ctccctcca cagggtgggg atctatggca
 54901 gttgcagggc ttactctcca cctacacaga catccagaaa agtttccggt tccccataac
 54961 gttatgttga tcttcccatg ctacaaaaga agagtgtggg ttctccctaa gtttgtatgt
 55021 catttttctc gtcttcccta cctccagcc ctacccagc caagggggcg tggccacttt
 55081 catgggtgaag atgctggggg ttctctgggc agccctcat atactgtatg atacgaatg
 55141 aaggaatcca caggtgaatg ctgatcgagg aagctccag tccagcaggg agggcagcca
 55201 tatatgcgaag gagcagaaac acagaatgtg acagagccag agagagggcg ccaagggcag
 55261 agagggacaag tctcactggg cctcaagggg tggccacagt gtggtctggg ggttggagg
 55321 cgaggtcttg gaacagacag cctcagctag aaagccctgg gggggcccat gtagggcctc
 55381 caagtaggca aaggggcaac agcaggtgca gcagcctggg actctaggaa gggggccctg
 55441 aaactctgaac ctcaatggcc atggcagtg caagaggggtc cttagggagg tttagggagg
 55501 tgctctcagc aatgtggagg acctccagga ggccgggcaa ggcagtgctt cccaaaggca
 55561 gggacagcga gcaaaacaaga cagagccagg caccacagaa gggcagagac gtagggcgcc
 55621 agagggaaat tgcggtgcca caggacaggg tggggcgctg tcttaagggg aggccttgat
 55681 ttttgtgttt ttgtttttcc cagaagtctc tccaagagt aaagtctctt tcttaggact
 55741 caagaagtca gaggccccc tctctggggc ccttggggtt tggggcagag tactggagca
 55801 gaaagcaggg ctgggctggg cctggggcca gacctcaatg actgtttctt tccgctcagc
 55861 gagcggagaa gcagtgcagc agtgtaccag gaggggaaag tgacggtggc cccaactctt
 55921 ctcttgaatg ggatatgacc accccaagc cccctcagtg ttgcaggag actctggcag
 55981 actcatgcc tcttctctgt gtgaacctg atccactac aaagaggaa agaaactccc
 56041 acccagccct acccttgctt ccaggggctt tgagacactc aggaagaagg gcttcaata
 56101 ttgtgagggt ctgtctgtgt cagccaccag gatgtcaat cctgctctgg ctggcagcat
 56161 gaccccttgt gacccctcta gcccccacca tgccccagtg gcccctctt ctgcttctt
 56221 cttttataca ttgtaaacac cacatttatt tgtctgaggc ttgcaaacct ctggtaagaa
 56281 gggacacaag cagggtctct cttcatgctg ccttggggcc cagctgcgca cagtgaggg
 56341 acRgagctgg cagatgagtc agaaattctt gggagcagc ccagggaagc agcagggcct
 56401 gctccttccc atgcccaatc ccgccaagac gggcctggac tgcagcgagg aagYggggct
 56461 agccagatcc cccaggtaac ttcgcccagc ggacctcttc ttggagctgc tctccctctt
 56521 ctccccatc cctctcaatc cccgcagagc tttagacctg gggcactgct ttggtccctc
 56581 acacaaggac caaacagct gctgtcagcg tgttctgtgt ggtcctgtct ctccagctag
 56641 gaagccagca gggcagggca ggcctggctc ttctctgga atcacacctg gccccagctg
 56701 cagcgctgag cactcagctg gggacaggRa ttggcaaaag cttgtccaga gaaacctRt
 56761 aggggagcag tgcattggcag ccgagctcag cctctctgga cctccattca ctgagctgt
 56821 ctgctggcctg aaatttgtta gggcctcaac tctctgtgtt gcagatgaac actcctctct
 56881 ccaagagggc cctcRggctt ggtgcaggc ttgggactgg gctctgaaa ctgcagcaag
 56941 gctcgtacttt caagggcctg aggaacagct ccagcttcat ggccatagcc aggtcgccct
 57001 tcaccttcag cgtcccaatc atgtaggccc ccagggSccc ggtcctctgt gggcagggc
 57061 cccgcaggtc tgccctggcc atctccacca ccacatcag gatgccatg ggaacccgtg
 57121 tctccactct tctcgtctct gtggggcnaa agaaaaaccga gtagctatg gggaaaggag
 57181 gaacgtgaag gagatctatg ggggtggagg gggctggtat tccccattg gaggagagta
 57241 ctgtttaaga gtttgggttc taataacctg ggtttgaagt ttaattggct ttgtaactct
 57301 tggatctcca gtttccaaat ctgtgatgat aattctctta gagatgacaa tctcctaaagc
 57361 ataggtctcat ggtgagaagt gggtagagata atgtacaaaa agtacttggc acagagcctg
 57421 acagggcaga ggcctgtaac acggggcagg cctcttggtat tggaaagcctg ctgcatgtgt
 57481 cctcggatg gcggggagac cagggcatag ttaatggctg gaaatgggtt ctagggccct

57541 gcttgcacatg ggttccaccc aaattattgg caggagcagg gggcagtcga cggagagcacc
57601 actggggatag gtaacaagaa acctagcaag ctggatggga aggagggcag aggagggcag
57661 cggcactagt agtgaggctc aggaagtagg cgctttgggt gScyctgggc agqacacat
57721 tgaactggtg gcaggccccg acttggctga ccaggggctc agacaggaag gqctgtagag
57781 cagtcagtag cccctccggc agaggctgct tcggactgga cctggcacc aacttggagg
57841 cagggtgctc aacttcactc accatctcca cgggtgtctc tgggggtgag ccaggaggtt
57901 ggggaagagg gcagagagga ggtcatctgt ttgccaaagt caggaccact caacttggcc
57961 tctgcacctt ttgtggcagt ttccctcttag atcccttca aggcctctgt caacttcttc
58021 cttctaccga aaggtgcccc tgagttttca gctcaaaact caaactcagt tcttaaaact
58081 cttccagctc agatataaaa ttctttccag ctgccccttc ggtgatgtct cttctcccca
58141 tggaggctgc caatggcctc tacacactca gacacctggc ctctctccac tgccttggct
58201 gtgttctcgt tgggctgaac atctgtgcag ggtgtglact gcacagagct cctgggtagt
58261 tgagcaaatg ctgtgctggc accaagctgg taacaccccc cgctctccct cccaggggat
58321 ctacactggc cccggggacg gggcactctc tgccattgag ttcatgtctc tctccaggct
58381 gtgcaggggc agctgctgga ggggtgctgt caggttgggc ccaagctggc tctctggg
58441 cggctggagc acggcctcca ctgccagctc cacggctgt acctccagcc cccaggccct
58501 ggtcacatct ttgattctca gctggaggac agtgtgagga gaaatgtaat taattcaaca
58561 aacctttctc gagcactctc ttltgggcaga ctgtgtggcc gtgcatggac agacclttag
58621 cacaccggcc ttgagacact cctagcctgg gaacacaggc agagggcaat gacclttag
58681 ctgtgttaag tgccaagaca gaagcaaggc ctgtgttgag ccccgagcag aggggttgg
58741 tgccagcagg agggagctct cagggtggag agggaccttc cagcacaagg aacagcatgt
58801 gcacaacccc agacaagaaa acctggcatg ttctgtgagc tgcaggagaa cagatttcca
58861 tttagctgca cctcacaatg tcggctgagg actggagaga gctgagggtt cagaggtggg
58921 gtgttctcgt ttactttgat ttattctgag gcaacaagaa gccccagagc ggggttggag
58981 caggggaggt atacagcaga ctgtctttaa ggcaagatcc tctctggctgc tgtggatgac
59041 gatttatagg gggctgaggg gagggtaggga gaccaaggaa gacattgttt caaataacct
59101 ccaaggaatg atgcagctct cggcagggtg gaggggagct gtaaggccaa gatccactga
59161 gggagctcgt cctctatcaa ctgtactgag ccacaacagg gcactcaaga agtgcacga
59221 ccaggctcgg ggtcgtctcg atgtgtgcaa tgatatgaga gggggcgaga gtggggagga
59281 ctcaagctcc tgatggatg agtgtggcat tcaatagaga ggcacacagg ggttgggaag
59341 gaggagatgt caactttttt tttttttttt actactgtaa tctgtagggt tctltgggac
59401 agtcaattgt ccagtaggca gctggagaaa tggccccagg gctagaagca tcaaggctgc
59461 ggcaggacat tgtgaataat cagcatccac agggcagaga cagccccagt ggaatggact
59521 tcccaggagc gtcacagatg agaagagccc agtgaataa cctgtgaaa ctaagggtc
59581 gagaataagt ggcagtaacc agggatgaca gggaaaggag aagtacaggg ggttctggg
59641 gctgggggct ggtctgacca tgtcaaatgc tgccaccagg tgatgtagg tgatggagc
59701 gagggtccca ctgggctggc atgtgggagg gggcgagggt gctggccagc gctgtcttg
59761 gagcccaagg aggccaggat gaaggatgta gggcgagggt gggcgagggt ggtgaaagt
59821 ctgccaagaa aaaaggggag aaaggagtg gtagctagag ggcactgtgg caaaggag
59881 gcacatttct acacagaaa gagaggtgac agagagagag tgcatggagt ggagggaagg
59941 catcctggga tagcaggggg cccacagcac tgccagctac agggatgagc ctaaggagag
60001 gaggcagaaa gggcaaggag gcaggaaagc agcacagagg agcagtggtt gtaggggtg
60061 aaactggagg aagcagagtg ctatccttag agtttttctc ctgagtgtta gggaggcagg
60121 cctgctcgag agagcaatga gcagtgttg ggtcgaggga gggcagtgaa gggcgtaag
60181 agctggcctg gagcactggc aggtlaaggag tggtaactgg ctaagggaag tccagcaagt
60241 gagggtggcg gactctgatt tctctagaag aaaaacaggc aaaaaggggc atgtgaaat
60301 gtgtacgctc gaaccagggc ctgaggcgcg tgtctggag ctctctgagt tctgtctcaa
60361 ccacaggcac agctctcact ctaccagggt ctcaactcag cctgggaaat cctgataaag
60421 gactctcaca tctgtgtgt gaactgacct ccccaaaact cctgtctcac atccacaaag
60481 gtgtcaacaa gactgagatc agtttttctc tctaaagt gaattaacac gggcaatctgt
60541 ttatgataaa aaagtgttga tccacttgc atctgagttg tgttagatca agcattggat
60601 tgaggggcga tgggtggatg gaggcagggt gcttagctat gcttagctat ggccttgc
60661 catagctctc agaggcaagt caaattattt cttagcctta gcttctctcc cccaataata
60721 caactagta cgcacttgca gcaaaaagt gcaagctcag aagtgtctgg ctaagagctg
60781 ggaactttga aaccataaac tgcataagac gtaagagcta ctgttaggat ctcaaatatg
60841 atttctccac gaatttcccc tgcctgcttc cagtgggagc tccaggagc gctattatcc
60901 cattccccgc actgtctctc aaccttgatt ccccagggca aagcagagcc aaagagagt
60961 ggggaagaa tcaactacat tccctgttca ggaacacaga ggaagaccaa gttgagttg
61021 gctgcagggg acacaaactc gcatgtgtat ttatttctac cccatcttgt agcagaagag
61081 attttagggc aactccaata tacacatgga gaagaggcag aaaaagaatc caaatgtctc
61141 catgttctct tgttctgttc caaacaagga acaaaaaatc acaagactgc acccgctcca
61201 tggtagcctc gaaattcccc agcaggtgac tgggctggga ggttccctgc tccatcagc
61261 atctgctcgc cccatgagtc agggccggaa tgaagctgt agaagccagt gtcatactg
61321 cagagcagtg aggggtaaaa actaaggggc agaccacaag aatgtcttgc ggggcactt

61381 cctcttctca gggacaagtt tgcccaggat cgttatggte taegcccacc tggcattcct
61441 caactcatgg ccccaccag cactctggctc ttcaaaagtg gttcaactat tggagacat
61501 ggttaacatga ggcccagagt ggctctgaetc tttctccaaa gtgacctggc aggtggagag
61561 agggcggatgc caccctcaa gctccgtctt gtgaggggct gctaccagaa agctgtgtcg
61621 tgatctttag cttctccatc tggatctccc gcaegcgctc cttgagcagg gctttggtca
61681 tggcgtttgc cgtgtctatg cgttggtgctg ttttcaggte tttcacagtc atccagcaca
61741 gcacccggct ccagatgcga aactggacat cggctccac ggagcagaca cggcctctct
61801 tagagggcag ctgttggggg agggccatgag agagagacac tcaagggctg gggggtagg
61861 ggaaggtcag cccactgggg ccaccagctc tgaaccactc gcttggcagc tagctctcca
61921 agggcaaatg tgttcaccaaa gtagttaggg tttaggttat gaagcaagga tgcctctcca
61981 gcttccatca attttctggt ctctctctcc ccttccccc cctagatagt gactcacagg
62041 ctgaggtctct ggcaccacag tacattctgg acaggccccc agttcctctg tcaagccagc
62101 tgagaagccc ctacccctgc agggagggagc gttagaagct cgttctctgg gactccacct
62161 ctgaaaggag tcaatgaagg gcaagagcag aacctgccca ggtccctagg gggtcggaat
62221 ccggcccgag cgggaaccaa tcatccgctc gttaggtggc acaatctgct caagatggca
62281 agggaaaagag ttgaaagtgg tcaagctagg ctggccaatg ctgtctgctc aggtctctct
62341 ctcaactctc tctctctcac ctgggttaca gttaggttat ccttagcagc tttccagagt
62401 agaaaaacaa cctctcaggga agctaaagtga ctgctcaaaa attgcatagc cttcaagtga
62461 atagtgaaga tttgaatgca gttctgaata actccaaaag ccatgtgtct taacYactga
62521 actgtattgc cttgatctct agagaaaact ttctactctg tggctgtgaag ttagctacga
62581 ctctataccag gaacctgtct gttcttgagt tagttaggag aaaaggtctSg gctgccctaa
62641 cagcaccccc ggggaaaagg ctttgtcaac tttaggtccc tggacctctc agagaagtag
62701 tgatgtccaa attgagaaat gaaggcccag agaggcaag aacctgtctc aaggttcaat
62761 ggcatttgtt cttgtggcag ttttagaact aggatataag gcattttaag gacccccctg
62821 cagaccacac caaaccacga ggttttctag agaggagctg tggcttaggg ctacacaag
62881 ggcgaagcct ccttgggctt ccaccttccc ccagcttcca cgtgcgctgc tgaactatg
62941 ctccatggct catctcttcc ccaactgtacc accctctatg gaaaatgagg cctgaatctg
63001 tattatgcac taccagctgg gctaagttgg gtgtttctat tcttaattta tcttaacca
63061 aagagaagat aatttggcaa agacatctgc gtgtactcta aagccagtg cctagctcca
63121 ggcacttagga gtttgggaat tgcctctacc cctactggc tccagatgt acttagaca
63181 agcccaaggc ttagtttctc cccctgacca atgtgaatga atgttctctg cctagccata
63241 tacacaaaagg gtaataata ttagggaaa ggggacagag gataggcaaa tttattctc
63301 aatgccaaag ctctcagtg gtgcccacaa ccttggggc tgaccagacc agccttacct
63361 tcagggcata actggacgaa atggggaagg tgaccaacag cagcaagatg cccaggaaga
63421 tgatgagggc atgacagagg caggagggcc agctctgggg tacatctgca ggtgagagca
63481 gaggtgttca actggacctg Nacgacagct gccaaagcga gtgaactgtg gcaagttgac
63541 ctctagYcca ccttcccctc gagaggctcc tctctctca gggctctcaa tctggctctc
63601 tgcctaata tccgtatct ttgggcagct gcaagttagg gctgttccc tctcccata
63661 catcaactc catttgtccc aagtccaaca accctcaaaa ggctctatc tctgtaggct
63721 aacagcattt caatctcaga atccagtcag cgtgatgat cctctctcac tggcttaggt
63781 aggggttcaat cctctcgttt aatttatatt gctactgaat gctctgcca agccagatc
63841 cactctggca tctgtaaaaa tgcactgaat ccttatgaag atgtgctctt agctcacagg
63901 atcagcccca gaagtgtgct tccagggagt ccacagatga ggaattagat tattattttc
64021 tatctcacac ccaactttaa tgccttaagt accataaaaa aatgcctatt tccagagatg
64081 ggcaccactgc actccagctc gggggacaga gcgagctccc atctcaaaaa acaacaacaa
64141 acaaaaaaac aaaaaacaaa aaaaaacccg cctatttcaa tcaagaaaaa tttgtagggg
64201 tgcgggtcag gggcagggtc agaaaagtga ggcctattcca agccaaatgt ttttagcccc
64261 ggaagttagc gagcccaagt tgggagcaaa gccgagacag cctcagaaat tgggagttag
64321 tatttgcgc cttctctccc acccctggac aggaagcagt cgggagccct gctccattc
64381 tccaggaagc cctgcccctc gggctaaagg ccagagcact gaggtccacc ttgtgctgt
64411 gctctgtacc accaggctct tcaagagact tctgtagtag gagagcttct aggacagga
64501 ggccagggag ggaatcaaat caaggttagg cgtttaggct gaacagcgtg ggtctgtccc
64561 tgtagtcгаа aggagccaca gaagactttg agggcaagac agaagcaggg cagactcaac
64621 aggcagctga ggaactgtca ttttggcctg cacatccagg agatgcctag tctccgggct
64681 tctagagttg ccccttaggg cgaaaattct tccatttccc tgcagcaggt gcttttaggg
64741 tgcctgtggc ctctctgccc tagacctcgg tttctctcat ttcgaataga aacctgaat
64801 gttctcccag gctcaagggt ctgataagag ctagaggaac ctagaggttt tagggtttt
64861 ggaagatag agcaaSgct gctggtcgtg gggccaaaag cctatgcacc tggggaggcg
64921 gactcggcgc tagcaccagg cgccgggtcc agccccctc caacatgta tcttcttctc
64981 agtccccctc cgttaggtgc gacggccagg gggccggcga cctctggagg cagagatc
65041 gggcctgggg gttgcgggac ggtccccccc ggStccggcg tgcacagcgg cctacatcc
65101 gccctgtccc ccaagccgac ccgtctccgg gacaagcagc ccttctgcga gcccgaaaag
65161 ccgaagctgc actgctgaaa cgggtcaaaa tcaccagggc gacagccggc gtaccagac

65221 ctgcgcagca tgcttttga caggagacac gccccgcgcc tcgcgcggcc gccctccctg
65281 gccagtggc cctacgcgc cccgccctcc tggctgctgc ttccggcttc accccgcgcg
65341 caccgccgcg cggcgcgccg gcaggaaagc gaggcccgcc ggggcccgctg tcgccgctgcg
65401 caatcgctccc ctgcgcgtgc gaggacgcga ctgcagccca gggtacttgg gtgtgctgcg
65461 cgttctccctgc accccgcgtgg ggtcatcgcc tctctccctc ttctctcaat caggccctaga
65521 aaagctggag gggaaagctgg gcacgctggc taactctat atcaatcaaa ttgggagaca
65581 tcaggcgagca ggaatcgcttg aggccaggaa ttccaggacca tccctgagcaa catagttaga
65641 gccatctctg acaaaaaatt tttaaaaaatt agcctggcgt gggatgactt cgtctggctg
65701 cagccactctg ggaggctgag gccggaggat ctcttgactc caggagtittg aggcctcagt
65761 gactgatgat gctgccactg caetgcagtc ggagcgagag agcaagatctg ctacaggggt
65821 tacaggaaag caatctcttc caggatcaag gacatgctat atcagctctc tcgacactcc
65881 ttctctccca ctggaggcag gacatgccat atctggactt tgggtttctc tgggacatag
65941 tctgcaaat attctctctt gtgaacccac agcccgagca cgagggactg ccatagggag
66001 ggtctcaata ctattttgtt aagtaatggc ctggccaggt caccgtgatc cagctggggt
66061 aggaaggcct gaactttggc acaaaaagaa agaagtttca catgcagact cggggagca
66121 tgggagtgtt aggaagaagg ggaatgacac gagctacatg agggcgaggg cccgacagca
66181 ccacagaggt gaggccctca gtctcgagg tccagaaaga gcatgccctt tgatccaggt
66241 acctggaatt aacttgccct tccagggtct gagaaaaact gaaatgcaact cgtcaatctc
66301 ctttgagaag tgttaacttc caacaggact ttggggtagt ctgggagcag gctatcttcc
66361 aaagcaagca aagaaatgaa taaagcttcc ccagctctgc ctctcagccg ataacgctct
66421 ggcctccgaa gcccatctct gccatagccc acttccaggt ccccttgatga aaggtctgcc
66481 caccatattt ggccttctat gactgattct ctaaaaggct gggagtactg ctacgggtgc
66541 agggaaaggc aggcctctga ggccttacag tccctaggaa gttgcgtatc tggccaaacc
66601 ctgctctcca cccctcgagc tgaatgggtt acaagagcca ggccctatca tcatcttctc
66661 tagctgtgtt ctaagtttga acagagatag gaatgggtac acaggagcca gcaagtggt
66721 tgcgagtgtt taagtttgaa gccggggcgc tgacccagtg aggtcactgc aagctgtgcc
66781 ccttctccctg taccagctgg gactctgaca tgcctttcca ttggcgagaa cctagctggc
66841 tctccctcca cctcttctat acccgctctc cagctctccc ctctccctc ccccaccca
66901 cctcagatcc accagccttt ccagctgtca ctcaaggcat ctcatctgctc cctcacctcc
66961 agtcaactgc tccaggat ctctgaatca agtccctct ctgcatccca cagcaactgt
67021 ctctagacag gccactgtct ctaggttgtg cagagtactg tgccatcatc gcaagctgtc
67081 tgcgtgttgt cctggtttcc aaactcttca gcaacttccc atcaatcaca caactgtgta
67141 aaactctctYa gctaggatct tgccttagca cactccttgg gtaactttc tcatgaattc
67201 cctcttaaat ctgaaaatgg ccaaaaattag ttcccaaaaa ggtcttttga agatgtatct
67261 ttctctgttc aagtgtcccc cgtaacccac cactcaaac cctaaatccc tgggtgaatt
67321 ccactgcttt tgagggtccc agctgtgggc tctcctttcc agaagtgtctc ggtttgcagg
67381 cttgctcttc cattacatct acggctctta gaagcaggg gctgcgtgtg gctcatcttt
67441 gtacgcccag ctcccggcag gactgtggac gaagcagtg cagtgtgaac ggtatgaatg
67501 atcaaaagcg ggagcagggc tgccccctcg cagctctgcc ctactcttYc cgtcttaccg
67561 taagtccagc gtaggctgc agctctccgc ctctactccc tcccgcctc gggcgtgtct
67621 ttaaaaccca cagtcggcct ctctgcccc tagaacccgc cccagctctc gttcacttc
67681 ctctccagc gggggccctg agccggcacc tcccctttcg gacagctcaa gctctcagc
67741 caactggctc acgctctccc ttcagcttct ctctcagcga tccaagatct aaaccgagaa
67801 tcgaaactaa gctggggtcc atggagcctg caccgcggc atctccaggg ccccgagcag
67861 accccgcggc gccccaggag ccacacatgc ctcccgcga gacccctctg gaaggccgc
67921 agcccagccc cagcccagc cctacagagg tactattggg ttgggggatg atggggttaa
67981 gctttgttgg ttgtctgtg tggggagagg cgggaagaga ggggtctaag caggtattgg
68041 tcaagtacc tagagagtga cacaagacgg gaagttagata gaggacagg aggaattggg
68101 cgggtggggc agggaaagga gggtaggata gagcaatgg gagcaagtgg gctcacttt
68161 cggcctcgc ttggctgcgg ttctccact ctgcagctgg gctcaacttt tgctcagat
68221 ggcctccggc cctgggcccct tccgccacc agtaccctct ttgcgctggc cttgagcag
68281 caggagcttc agattaggga ggaatggagg agtaccctct ttgcgctggc cttgagcag
68341 ggcctagtcc caggcacgac aaaaactaaa ccaacttccc atgtccgagg tgagaaactg
68401 gctcagactc aagaggtatc ttggccaaag cctccagct cagctgtgtt ttgttaagg
68461 aagcctcccc aacgaacctc tctctgcca cactttctc gccacactcc accctcccc
68521 gacaaagga ctaetgggt ttctgtctc gctgccttcc aggcctttt accctcccc
68581 atgaagatga agaggacacc gtattacagt aacttttata acaattatta caactaagaa
68641 taacattact taacaatact agttaacatt tatgtttgtt ttgtttgtt ttgtttgtt
68701 attaaagcat ttggttttt ttgtttgtt gagacggag tctcactgt cgcacagct tgggttga
68761 ttgtttatct gttgttttt caacctctc ctccgggtt cagccatct tcttctca
68821 ggtgcgactc cggctcactg caacctctc gccaaccata cctcagctc tcttatttt
68881 gccctccagc tagctgggat taagtgagc atgtgtgct ctaactcctg acctcgtgat
68941 taagtgaagt ggggtttcac tatgtggcc atacagcca taggccacca
69001 caccaccca cggctctcca aagtgtggg

```

69061 gttttttgatt ttacaaaaat gtggttaaaat ataccctaag gataaagtcc tatgttaacc
69121 ttattataagt gtaccattca gtggcattaa gttagattgct aattattggtc aaccatcacc
69181 accatctaat tccagaacct ttctattact ccagaatact tgactctctt aaacctatagg
69241 ggagggaatag agtgcttgcc tcaccctctc tagtttccct ggctggggcta tgaattaaat
69301 agcctatgaa ttaaatagtc ataaaaataga ttaccagcgg aaaaaccata tttaattaca
69361 tatgtatact caggagtcoc acaatatagt agactcaaa agaggtcaga tgattgagat
69421 ctgtataaaca tcttgagcta cggaaaaagag ctggagcctt ctgggtgatg gtgataaac
69481 aagttatgtg aggttgagga gaggagctgt ttggtgaata gaggttgctt tgctatgatg
69541 attaaaaagt cttagataaat aaaaagttgtc tggagcagcc ctcttttaat atagatcatt
69601 ttactaaatt agattttctt ttaagatata aalgcttttc ttttttcaaa aagagagact
69661 tttcagagct attccttgtat cagcagtttc tcagaataac cagcttaaaa tatgccaaag
69721 aagtatattt caagagcctc ctgcagtcac actttgaagt ggtgtgtcct gagccccagt
69781 aatgccaatg ctctctattt tctcttccc ctagcccttg gtaacttcta atctaccttc
69841 tgtccctatg aacttaacta ttctagatat ttcatgtaag tggaaattgtt accgatagag
69901 gatcttgact gcaaatgttt caggttcttg gcattttgaa caaagaaattg gacaaaatgt
69961 acagcaaaagc aaggaaaagag tgaagcaatg aaagcagaga tttattgaaa atgaaagtac
70021 accccaacag gtgggagcgg ctagagcagg gctcaaggac cccagttaac gaattctctg
70081 ggttccaaat accccctaga ggtttcccat tggccacttg gtttttcccc acttggttgt
70141 agaaagcaac caaccagacg tactttcaat ttccatctg cctcgacaga aatgggggtga
70201 ttgtcaaaag tagtagcctc tcttctcttt gttaactgag gatcgagagt cttaagatag
70261 ctcttcgatt agttctagga agtcagaggg aaatcgccctt aggttccctg cctccagacc
70321 ctatttctct ccctcagaat catcacagtg ttgacctttt tgtaactgctt tatcttactt
70381 agcataatgt cattgaggtc tatctatgtt gtacagtga tcagaatttc atttctttct
70441 aacgctgagt aattattccat tatattgtga gaccacattt tgttttatata ttcatgtgtt
70501 gatggatact tggattgttt ctacattttg tctattgtga atagtgttgc tgtggacatt
70561 gtgtgtaacg tatctgtttg gcccttggtt ttacatcttt tggttatata tctaagatag
70621 gaatttctggt gtcatattgt tgttccatgc ttacctcttt aatgcaacccc caaactgtgc
70681 attaaagact ttatatgagg ttggtactta gtgtatctac gtgttccctg aggttctgtt
70741 aaggcagaat gtatcctaca cctcttata ctacagacct attactgtgg gtgtatgaga
70801 tgatagctc aataaattgtt gcagtgagag ctggagggcc tgaataaatg gggttatgg
70861 ggtgctgata agccagggtt ttgcatctc caatgactgg ctggaatgga atgagatctc
70921 ctactcctagg gtccagctgt aagggttggt ggccggtagg tgggggcttt ttgtgacttt
70981 ccaggctcca cctgctctc tgggtcccca gcgagccccc gcttcggagg aggagtacca
71041 gtttctcgcg tgcacgaat gccaggcga agccaagtgc agccaagctgc tgcctgtctt
71101 gcacacgctg tgcctcaggt gccctggagg gtccggcatg cagtgcccca tctcctgagg
71161 gccctggccc ctagggtcag acacacccgc cctggataac gcttttttgc agagtctgca
71221 cgccgcccgt tccgtgtacc ggcagattgt ggtgcgcag gctgtgtgca cccgtgcaa
71281 agagtgcggc gacttctggt gctttgagtg cgagcagctc ctctgcacca agtctctga
71341 ggcacacagc tggttcctca agcacgagcg ccgccccta gcagagctgc gcaaccagtc
71401 gctgcgtgag ttcttgagcg gcacccgcaa gaccaacaac atcttctgct ccaaccctaa
71461 ccaccgcacc cctacgctga ccaggtgagt aggcccgca aggggtgggt ggtgcatcca
71521 agtaccagtg agggggcgag aggagcaaa atccaaagag tcacacaggt tcacagctga
71581 agcttctggg gccttgcaac tctaaatgtg gtctgcagat atgcagtgct cggttgtgtg
71641 accacaattt atgtcgccaK tccaaccgca ggtgtgatgt atgtttccag ttctctctct
71701 taataaataa tgcgtcagaa tcatctttgc atctttatcc agtaactctt tttaggataa
71761 ttttttagag tgccactgct ggggtgtagg ggcagggaa tctcaattgt tactatgta
71821 caaaactgcc ctttagaatt tagtggaatt ttccgagagc actgacacgg taatctcagta
71881 aggctgtgatt ctaggatcag agacaRgtag Ktagtttctc tctgaaaagt tgaaccattt
71941 aacaccagcg agcgctatct gagaaatgct gtatggggaa aaaaaataac atccagttgt
72001 aattattttt attaaacaga ttttaactca gttttttaat agaaataaca ttctacagt
72061 tcacgaacaa aatttgttaa gaggagagag agagtgaat ctctgtgcca tgcccaactg
72121 cctaattccc accactctc cctctccca

```

CASPR4 genomic sequence (SEQ ID NO: 6)

>16:76177651-76273450

```

1 ccatctcгаа aaaaaaaaaa aaaaaaaaaa aaacagaaaa gaaaaaatat atgaactctt
61 atgaactgtgata gatacacata gcaattgtgag ataaattgtg atattgcttc acgctcttta
121 aatggatctgt ttgttaagca agcaaaaaat ttatttgaag agagggacta gatttaacag
181 ggaatttaatt ttgggtgctc ttcaRagtgt acaccccata tccagttcat taagataaaa

```

241 tcaacctgag aacaacattt ttaaaacact tgataacttg tatctcacat tctaccatgt
301 gacaattcaa tgacaacate actccctttt cttctaccacg cttccgcgtac
321 tgggtcttag acatctgctt ttggctgctc tcattcccac ggaggtcaca ttltgcaatt
361 ttcaactcttg gaagcagttc tgttcccttg aagtgtttct lcatgttctc tagtagccta
481 gacaaaaata atacttccca ttcaactttgc taattttcca tcttttaattt atatacttta
541 ttaagtataa tttaaataga gaagagatga aaaaaattt acaaactattt ttgaggtttg
601 ctgttctagt tgatgatagt ttcttttgcg gtgcaagaag tctcttagttt aatagatcc
661 caatttctcta ttltgglttt tgttgcattt gcttttgglt tttagtcatg gaaggtcatt
721 cccatgccta ggtcctgaat ggtatlgcct aggtttttct ciaggggtttt tatgtttata
781 ggtcttcagt ttaagtcttt aatccalcit gagttaattt tgcataaagg ttgagggaag
841 ggatttcagt tcagctttct gcataYggct agccagtttt cccaacacca tttattaaat
901 aggggaatcct ttcccatgt cttgttttltg tcaggtttgt caaagatcag atggttttag
961 atgtgtggcg ttatttctga ggccctctgt ctgttccctt ggtctatata tctgttttga
1021 tatcagtaac atgctgtttt tgttactgta gccctgttag atagtttgaa gcctaggtact
1081 gtgagtgttc cagcttltgt cttttgcta ggtatttctt ggctatgtgg gcctttttt
1141 ggttccatat gaaatttaaa gtatttttgg ctaattctgt gaagaaagtc aatggagaaa
1201 ctaagatttg aagtggatag aattatattt cttaaaaaact ctggccaggc gttgtggctc
1261 acacgtgtta tccagcact ttggggagcc aagcggggtg gatccagagt gaagaatcaca
1321 tcaaaaactag cctggccaac atggtgaaat cctgtctcta ctaaaaactac aaaaaattac
1381 cgggtgtatg ttgctgagac ctgtaatccc agctacttgc gaggctgagg caggagaatt
1441 cgttgaacct ggggagactga ggttgagtg agctgagatc agcccaactgc accctctcc
1501 gggggagcaga gtgagactcc gttctaaaaa aaaaaaaact aagactcaag agaatcact
1561 gggttaattac tttttataaa ggtaattcag taatgtctct aacaacaaaa tgaattttta
1621 aattcttaag ttctcttctt agatataaat aactacatgg aactgtgaaa aagaatcaca
1681 agccattttg taatagaatc caaactagat tagattggaa gttgggttga tttatttttg
1741 atttgcataa ttatcttca tggaaatata tatctgaaq ttctcttctt tagtcttagt
1801 atgtcttttt gttattgttg tcttttatgt tttaattttt tgccttttaag tttttttatc
1861 ttgtgctatt tacatttacc ttlttagtlt cgtgtcaaat tataaaaaat ttgtgtgaat
1921 ttttttaaac ttttaggttc agggatatac gtgcaagttt gttgtatagt taaactcttg
1981 tgtacagat tatlttltca gccaggtact aagccttgta cccaatagtt aatttttctg
2041 ctctctctgt tcttcccacc ctccattctc aagttaagccc cagtgctctg ttgtcccttc
2101 ctgtgtttta tgagtcttca tcattagctt cccactata ttagtgaaaca tatagcattt
2161 ggttttctgt tctgtcatta gtttgcataa gataatggcc tccagttcca tccatgttcc
2221 caaaaacagac ataactctat tcttttctta cggctgcata gttattacatg atcatatgt
2281 atcacatttt ctttatccag tcttctcatt atgggcatit atgttgattc catgtctttt
2341 ctatttgtac tagtgtgca gtaaacattt gcgtgcattg gcttttctgg tagaatgttt
2401 ctactatctc tgggtatgta ctcaagtagt ggattgtctg gtcaaaaggt tcttagctgt
2461 ttgaggaatt gccatactgc ttcccacaat ggttgaacta atttagactc caccacaag
2521 tgtataagta atccaaaaa tgaagaagata tcaagaaaaa aatgttaata gaatgttca
2581 aagaacacaaa aaaagaacta tttagaatat tactaaaagga catagaagaa cactgtgac
2641 aatgcaaggta tgtatctgtt tttagtgaaa agataatatt ataaagctat tcatctctcc
2701 taaaactctc catataaatg agatcattct gaatgtcata tagaaaactg tatatagaaa
2761 taactaatgt taattagcaa aaacaataat ggtagagaga attacactgt caaaaaaat
2821 ttattaaatg atattaata aaacttattg atactggcac attaaaattt ggataagaaa
2881 cacatgggac atctgttact atgtccaaat acatttaggg atttgcataa aatagataga
2941 gcattgtaaa gcttaataca tatttaaggga aatatgtatt agtcaaatag gaaatcatag
3001 cctctagaag aagtagataa cttgtttata tcaaaataga ttttaataaa atattttaaa
3061 gtaatacaga tgcagaaaaa agtattaaaa gaaaatatag gacaattgaa agatcacat
3121 tgaatatgtg acggggcgct tctttctagg caaagggaac caaacccaaa tgccataaag
3181 gaaaagatga aaaaatagat aataatgga aggtgcata aaaaataaac ataatgata
3241 taaaagaaag ggtatatact gggaatatat tttagctcat atgatagcaa tgccacatt
3301 tattcagcag cagcagtggt cttgtgttlaa gactgcattt ctgactgact atagagctt
3361 cattcagcta catatttact tagatttaaa aataataaag ggagggcaac cactcagcat
3421 gcacagcaac agcataaalag atgttcagct atcatgaaca tcttttaaat atcccaaat
3481 ctgtcactgag cttgtgtgggt gtattgaaac aacttttaaa tctctgaata atctctcact
3541 gcttagtggg tgtgccacc acacatcagg aagaacatga tccaggggg tcttagctg
3601 cttaacatcac attagtgatg taacttttca gggatacttg ccaactgttc tccatgtag
3661 ctggtatctt atcagttcta ggctattcac tggattccag ttgtatgtct tagtagctga
3721 atttcaactgt gcaatttcat tctgttacct agggagactg tctagagctg ggagcccgag
3781 tttttaaatt gaatttttaa aaatatctcc aatatgttct aattagctgc aagatataag
3841 aaacattggg ttgctcagta atcttgacaa ccaggtacag gtttttagtt cagtaacaaa
3901 cataccagca ggaatcccat tcatcttaga tctcttctga ctttctttga tttaagtgt
3961 caagaagagt ttggctaaag ataaagagta ggaaaaagc tacagcttag agtatatttc
4021 tatatttccca ataatatga cacaaatttc ttaattcca attctctgt

4081 gtactgtacta gccacacagg gtactgtaaa aggattataa gttattctac tataaagata
4141 catgcacacq tatgtttatt gcagcactat tcaacatagc aagactctgg aaccaaccaca
4201 aatgccctctc aRtcatagac tggataaaga aatgtggcca catatacact ctggaataact
4261 atgcagccct aaaaaatgag ttcatgtcct ttgcaggagc atggtatgaq ctggaacaca
4321 tcatctctcag caaaccaaca caggaacaga aaaccaataa cagcatgttc tcaactcaaa
4381 gtggaggtgtg acaaatgaga acatatgggc acagggaggg agactatcac cacocggggc
4441 tqtgtgtggg taagggggcaa ggggggggag agcattagga gaaataccta atgtatgata
4501 tgggtgtgat tgggtcagcaa accacatggy caactgtata cctatgtaac aaacctgcac
4561 atctctcagc tgtatccagc aacttaagta taataaaaaa ataaataatc attaataaaa
4621 ttaaaaaaa agctcctcag ttacactcg cccatttga agactctcaat ggtgcgttta
4681 gaccagtggt tactggatta gacagaaacg ttatggaaca ctctccatcat cacaaaaatt
4741 ctcaacatag tataagtatg aaactttcta aaaaacagta caactcatt cctgtatttt
4801 ttttgttttt tctgtttttg gttaaaaaaa aaagagccat tatataaaca ggcagttcat
4861 agaaaggaaa aaatgatata taatatataa aagtatctt caacctcatt caaataagaa
4921 ataacacatc ctataaagatt ggaatgaaa calttgaaac tgcataatatt tagacattat
4981 ttctcaatgt gtgcaatata acaaaataat acgttctttc attttaagtt attcatttca
5041 tataattttt ctttaaaatt ttttaagctac tgcatacac ccatggatatt atgtgttactg
5101 ctgttttaata caagatagac aggggttttcc agagaaatgg agactacatg atcatatgaa
5161 tgggaactggy tttatgcaat tatggagacc aagaagtctc accatctgct gtctttttagc
5221 aggataacca ggaagactgq tggcttaatt tagtctaagt ctggaagccc aaggaccaga
5281 agctcagatg tccaaaggca gaagaacatg aatgcttcag ctcaagaaga gagagccagg
5341 cacagtagct catgctctga atccctgccc ttgggaagc caaggtggga gqatttactg
5401 agcccagagc ttcaagagca acctgagcaa catagtgaac ctccactctc acagaaaaaca
5461 caaaaaatga accggtgggg tgggtgcagc ctgtagtccc agctactcag gaggctcagg
5521 caggaggtac gcttcagcct ggggaagcaga tgttgtagtg agctagatgt gctccactct
5581 actccagctc gggcaacaga gtgagccctc gtttcaaga gtggaggaga gggagcaga
5641 gagagagagg attgcccctt tctctccctg ttgttctcat tttagccttc aatgatttgg
5701 atttatctctg cctacaatgg tgaggggcagc tctctttact cagtctacca attcgaatg
5761 aatctctctt ggaacacccc tcaacagacat actcaagaat aatattttgc acagtgtctg
5821 ggtacacact taccagtca tgtggaaaata tcaaatgaac cctcacatga caaatagcta
5881 tctcctactgt gttatagcat aatatctggt aacatttact gatagataaa agctRaccct
5941 ggtgtgcaat acaagcacc accacagatt attgttcaat atttttagat ttttaactcca
6001 tatatatagg tgtgtgggtt tcatatgtgc agcatgtcat ctaactctgag tgtattctga
6061 cagaaaaaaa aaaaactta gtctgtgttc taaattgtcc taactgtcag tgcctccaca
6121 gagaaacaa ttacctcaga atgtcagaac ctgttaaaag gctcagccac agaatatgag
6181 aagcagtggt tactttttg gggctggagc ctgttaaaag tctcctcttc tacciaatag
6241 cagcctgagg cagagcaaaa gtgggaagaa ataccctggt tctctcttc ctctcacttg
6301 cagatctctt tcaagttccc agctgggaagc tcttaatac agggagcttg gacacagctc
6361 acgtcactca gccctcta atgtttgggtc agagcaggga aagggtgaca cgtggttctc
6421 agtgaacacg acgatgagg acagcctgaa gaaggtatgt tactaacacg aaattgtctc
6481 tatgagctgc tttttctttg ctatagaag aggatgcagg cagaaatcaa gctactactg
6541 agtgattctc actcctcttt cagttttgaa attgcatgct tccctttcaa cccataaaga
6601 aaatagataca atattttgat actgaggaaa ttgagattta agataaagt ttccctgtaa
6661 tatgttaac tagtgccaca tgtataaaat tttacattta ggcctctctc ctctgggtaa
6721 tatttatgag taggcaagc tagccaagaa cagtttttca atgtcctgaa gaagggagat
6781 coactgaaaa tgcgtgaacca ttggtttagg gtcaattttg tcaataatc acactctaca
6841 aagtagagtg gtgctctcct taatcaatta tgcattcaat tctttatttc tcaaaatag
6901 tgttagagtg caaacacatg atttgcttcc taatgtggaa tactactgagg acatcttca
6961 gatgatcaaa catcaaacat cttaacacat agctccagag tctactgagg atgacacagg
7021 tatatatgta cottaataca catctgtttt ctgtttttgt ttgtttttgt ttgtttttgt
7081 aatggatctt cttctgtcgc ctgggctgga gtgcaagtcg acgatctggt ttgactgcaa
7141 cctccacctc coggattcaa gcgaactccc gtaatttttg gtaattttag tagaacaagg gttccacct
7201 aggtgcgtgc cctcccgctc gctaaatttt tgagggtgac tgagcagctg actctggtaa
7261 gttatccagt ctggtctcga actcctgacc tggagtgctc ttgtcaactc tgggacaaag
7321 aatgctgga ttacaggcat gagccacac accctgcctg ttgtcaactc tgggacaaag
7381 ttacaacaca cacttggtat gcaaaaggaaa gcaactact agactttatt ttgacttatt
7441 gcttagctgag aagatcttat ggctctgtcc agtctcaacc ttggcatatt cctctgatg
7501 tttcctgtg caaacagact ccaagctcag gtgttttaatt gtgtctcta ctctcagtt
7561 caaagtttct tgtactttcc tatttctctt ctgggtgata ctctcagtt gctcaatgca
7621 tgtctgccaa caaagcttta gttcatccaa gttctccaaa gcttcccaaa acatcaagc
7681 tcaacttact ctcaagttcca cttttgcccc tcaactttcc aatatcaact taatcaatc
7741 taagttctta ctccaatga catctgtgat agtgttatt coaggaggtg tctgcattgc
7801 tttgcagggt ttgtataact ttaatacaac gaatttccaa tccaccatc taattttgtt
7861 ctatttctatt ctacttatat gttgctgat aatggtgtg tccagccca aatttttttt

7921	tttttttttt	tgagacggag	tccactctg	ttgccaggc	ttgaatcgag	tggcgcaatc
7981	tcgggttca	gcaagctccg	ctccaccagt	ccatgccatt	ctcctgcctc	agccctccga
8041	gtacctggga	ctacaggcgc	ccgccaccag	gccacagtaa	tttttttttt	tttttgtatt
8101	tttagtagag	acagagtttc	actgtgttag	ccaggatggt	ctctatttcc	tcagctctgt
8161	attctgcgcc	ctcgccctcc	caaaagtactg	ggattacagg	cggtggccac	cgctccctgc
8221	tggctccacc	aaaactctat	cttgagttgt	agctgcgatg	atttccacgt	gtttgtggag
8281	ggacccaatt	tgagataatt	gaatcacgtg	ggcagtttcc	cccatactgt	tcctctggta
8341	gtgagtaagt	ctcatgagat	ctgatggttt	tgtaaaagggt	tttccctctt	ctctggctct
8401	catctctgtc	tttctgccac	catgtaagac	atgcctcttc	ccatgagttc	gagcctctcc
8461	cagccacatg	gaactaagtc	cattaaacct	cttttcttt	ataaattacc	caagctctgc
8521	tatgtcttta	tcaacagcat	gaaaatggac	taatacattg	gccctggttc	gaattatacc
8581	tttgacataa	ataattactc	aagtgctact	ggcctaaatg	catactatgt	atattattct
8641	tattgaaagt	tgtacctatt	tcctaaaggt	atgaattccc	agaagataga	aactccatgc
8701	tttgttgtta	atgtggtttc	gaagagatat	tgataatatt	atttgagtat	aaagaacac
8761	ttttcatgat	tacttcgaat	ctgaaatata	ataatctgat	gtgtctcgctg	gtttacagca
8821	cagggtgtac	tgtacaaact	gagactatga	gggtgtacat	ctgatattcc	acataaata
8881	tgtaatat	tccatataaa	taggtgaata	tattccacat	aaataggtga	atataattca
8941	cataaata	tgtaataatt	ccacataaat	aggtgaatat	atttccacat	ataaggtgaa
9001	tatatctcac	ataaataagt	gaataatatt	cacatataat	tggtgaatat	atttccacat
9061	aaatattgta	ataatattca	cataaata	tgagatata	ttcacaaaaa	tatgtaaaag
9121	aaacattctt	agtcataaaa	accaggactt	gaactacata	gctttatctat	tcocatattc
9181	caattgcctt	tataagtcac	acctctaaat	tgccctgttc	taagattttt	tccttttttt
9241	attatctgca	ctaaatttcc	tccttccaga	aatgttcaca	aaaaataact	tggtgtactt
9301	agaagagcca	tggttttagg	aaaagattca	aatgttagga	catgtgtcca	gaagtagact
9361	tgagtattga	aggaggaac	tgacagggcg	cagtggtcca	ttctcatgct	gtaattctcg
9421	cacttttgta	ggccgaggca	gggtgatcac	ctgagctcag	catttgccca	cgactctgcg
9481	caacatgtgt	aaacctatc	ctactaaaa	atacaaaaa	taggccagca	tggtggcagg
9541	cgccgttgat	ccagctact	tggtgggctg	aggtggggga	gcacttgaa	cgaggtgagt
9601	ggaggttgca	atgagccaa	atcacgccat	tgacctccag	ccctgggtac	aaaggtgaaa
9661	ctccatctca	caaaaaaaa	aaaaaaaaga	aaaggaagg	aaacaggaag	caaaaatact
9721	aaagcatatg	ctacagaatt	gtgtctataa	atcagagaga	taagagatca	agtccaaaat
9781	gaatcactgt	ttttgtgtct	acaaaaataa	atttgtaat	ggcttttgaa	taccattctt
9841	ctattttggg	ttgtctcatg	ttaattcttc	atactgaac	gtgtctccc	ttttgaagcc
9901	atgagacttt	taagtaccta	ataataggat	tccttttccg	taagttagag	aggagagaaa
9961	aattgtctga	gcagtgaaaa	gacatcctca	gggggcaat	actttattac	atattgttca
10021	gaataatcat	gaatttgggt	cggtctagag	aatatcagtt	tcagagaaaa	gaatcttcta
10081	ttatttttag	cgagtttgtg	gaaagtgtca	gaaaattatc	ccaagagcta	caaagcgatt
10141	atgtttactaa	ttccatcttt	gtactctacc	ctgaaataat	gtaaaaaact	taataataca
10201	ctttgaaaaa	caatttctga	tccttaaatc	agaataaata	catgaattaa	ttaaactcac
10261	agggagctgt	gctcacctta	aaactcttta	tgtgaacaat	gataggtaaa	taatgaaatt
10321	tatctggatt	ggaataaatt	tggtctgtcc	agccttcttg	ttctcataaa	ctcaaaattc
10381	ttgtatttat	gtacacacaa	acattgaatt	tcctgttaca	ttaactctac	ttctttagtt
10441	tgcatttttt	aaaattttta	gtctgtgaac	atttaataca	tctaagttga	ataaagtata
10501	tactttacta	tgacactatt	attattatta	tattatttat	tattatttat	attattattt
10561	gagagaagtc	tcgtcttgt	ccccaggct	tgagtccaat	ggctcaactc	cggtctcacg
10621	caacctctgc	ctcctgggtt	caaatgattc	tcctgcctct	ggctctcaag	tgaactggat
10681	taaggtgcct	gccactatgc	ctggctaatt	tttgtctttt	ttagtagaga	tggtgttcca
10741	catgtgtg	caggctgtgc	tcgaactcct	gacctcaagt	gtctgcgccg	gttctgtccc
10801	ccaaaatgct	gggatttacg	gcgtcagcca	tcacgcccg	ccagcagaa	tttttttaag
10861	agaaatttct	accaagaaga	aagactactt	tggtgtattt	agctgacagt	atttactagg
10921	tgacgtggct	catgcctgta	atccagcac	ttttggaggt	tgaggcggtg	ggataactgt
10981	agcgtcaaga	ttcgagacca	gcctgggtta	catggtaaaa	ccctgtctcc	agcgaattta
11041	caaaaaatcag	ccaggcgtgg	tggtcatgtc	ctgcagtcct	agctactggg	gagcgtgagg
11101	caagagactc	acttgaacct	gggaggggga	gggttcaagt	agctgagatc	acagactctc
11161	actccagcct	aggtgacaga	gcaaggctgt	ctcagaaaaa	ggcatataat	tatgaaatat
11221	atttatctta	ctctgtccta	ctttgaatat	tgcatagggc	cttctcagtg	ggtcttttgt
11281	catgtaggaa	agctgtgcga	cttttccagt	ctcagcacac	agtagaacca	ggtgtgtctt
11341	tacctttgct	ccaggaaaag	tccttgttaa	tcattctctt	ctctctccca	ctctgtctcc
11401	caaccgccag	ctcctgcact	agaagtgtag	taaatgtgag	tagacttaat	taactggggc
11461	taggttagca	aaacatcatg	acacaYgtc	tcattttctg	ggaggaagt	taactgtgct
11521	tatgtgaaat	agtgagcctc	ctctctgtgt	gtgagccaa	agtgacttga	atagtcgaat
11581	tgctcagttca	aggtcagtg	tggagaccac	gcactaaaaa	gaagatgag	tgagagcg
11641	atgaatatgc	gttaaggatg	tcactctctg	tatcagattg	catgcatcca	gatgcaggct
11701	ccatctcatg	caagctgtgt	gaccttgggc	agttgtcttt	acctctctca	taaaaataag

11761 gtagacacacg tatacacatg aaagagtttg tgtgaaagtt aaatacaaaa ggagacaaga
 11821 agggagcagca gaagaaggag gaggtggagg aggagagagt taggggggag gagagagaag
 11881 gtagggagaga gataaaagggg aaggggaaaa agagggaaat aaegaaaagc agacgaagaa
 11941 gaacacccctt atgcaattaa atgcaaaaaa aatacaactc atgcaaaatt aacatagatc
 12001 tgaagttatc agcaattcag ctaaaagggtg agagttagtg tctcaactgt tgcagcggtt
 12061 tgcggaaagc aaatttgatg tggagtgtaa aagagaaaaa agcaaatact accccaagag
 12121 aaagggaaag gactgcctaa cataaaggcc attcgagagc gtagtgtagt gaagtagagag
 12181 attcaaatca cagttggcctt ggaagagaca tgtctctta ttataaagga gaaagaaaag
 12241 laaagacagag tttagacttc agtctatata aaggaacctt catatgcaaa gagatcgtag
 12301 atttactgag agcaaaaggg gaggtgtgag aatggtacct ccttgaaaaa tatcccacc
 12361 acagtcggag agccacagcgt tggccaaaag gcatgaacag gtcaactgtg cagactgtga
 12421 atggggcttc tgcagctgtg tgcacactgtg catcacaggg aactggaagt atgacatttt
 12481 agggcccgag gttggaatcc acagggatac tgtgtagtta ggacactagg acaagacat
 12541 atggggctgc gcaagagcat ggaggaagag aagttaccat gactgagaac catgtagaaa
 12601 aggaagtga gtcaggaggg gtgaggttga taggagattg tattagttag gatcttccag
 12661 agaaaacaaa ctaacaaggt ttgtgtgtgt ttgtgtgtgt gttgtgtgtgt gttgtgtgtgt
 12721 gtgtgtgtat acatatacat acatgtattgg aggttggagg agatgggaga ttatttttaa
 12781 ggagttggct cgtcaatcg acagggcttg caagtcctaa atctcgagg taggctggca
 12841 ggcttaggag tcagggcaga gttgcagttt aagtcctaa gcatgtgtct ggcacatttc
 12901 cctcttattc caggggaagtc agtctttttt ttcatattt gagaccttgc agtgatttag
 12961 tggggcccat ccatactatg aagataattt gctttactta gtgtctatgg attttaaat
 13021 taactctatt taaaaatacc tttaagaaa catctagaat aatgttttgg caaattgtgt
 13081 ggtatggtag cctagtcaag gtgagtcaata actttaacca tcaaaaagat ggaaagtgtc
 13141 taagggaagca tggagttact gaggtcgaaa agcaaataaa aactggaatg ttgaagagag
 13201 tcggaaagat tcaagtgtct atggtggaaag aatagaatat acacgtttat attttcaag
 13261 atgggtccat tcatggaagt gattaagaag aaggtgtggg cagggaagag ttgaagagga
 13321 gtctgtgaaa gtcattttag gtgtttttat ggtcaaccac aaggtctttg aagcagagag
 13381 tttgcaagggt gtgaagaaa tgacctgtgg ttgccaagag gacctcagtc tagaggggca
 13441 aagtttgtca tcaccagctg acactcataa aaaaggagaa taaattgttt ttctctccct
 13501 catttttttc ttgtggcacc tcaatttttac aaggaaagaaa taaaattctt cttctcttgc
 13561 cagaagaact ataaaaatgc ttaactgactc catggaaata tagcatgtgg gaaaagttag
 13621 cactctgacac cttaggtccc agaattgtca ttggatttcc aggtggagag atttccacct
 13681 gctagtggca ttatgcaag ctttgtctgt gcatgtcccc acatttcaat ttctagaag
 13741 aataaatata agttttcagg agttacacac ctctcaaac taccaaacag taccctgtgg
 13801 agtctggatt agaaaaccag gctgctcgaa tccagagatc actctcaatt ctcattttat
 13861 aacaattata agagagtttc ttgtttttat tggagattct aaaaaggagg aggatgggag
 13921 agggtagagg atgaaaattt accatgggga tacaatgtac actattcagg tgatggggag
 13981 actaaaagcc cagaaactcat tattgcacaa tataatccatg taacaatttt cagttatact
 14041 ccttaaatct atcaaattaa aaaataaaaa aataataatga ggacctgtga tggcagaaaa
 14101 aagatcggtg gaagaaagag aagacagcag tggaaaaacca ggcctccaca tgtcttttgt
 14161 agtagccttt gtatgtagcta atacggaagt cagatggagt tgaagaaggtg gacagatact
 14221 tgtgatttgc aagggaagta tactgtttct ggcataagtg ggcataagca ggtattgtat
 14281 gtgctggtaa actccaggtc tgtccatata acaggtcatg acatggaaat tgtgggttta
 14341 gaaatggaca gacaagggga cttttctgag tagaccttgg ttgaagctgt ggggtatccc
 14401 tggcctcact gttgtgaat gtctgtgtcc agtgtattct tgcagttcca gccctgacca
 14461 cactccagct ttctaggtgc atctcacata ctctccataa gttgcatcaa gttcaggttt
 14521 ttttgaggga tgttgtgtc ctgcaaatgc tgtcctccat gtcagtgagg gagaaaaaac
 14581 ggcccaaggt ttctcaccta gggctggcca agaggagccc tgtgcatcaa gttcaggttt
 14641 gggcaagagg aggaacctga gccatcttgg tgtggtgaag aaactttatg tatcagagag
 14701 agggcttcag ttctatggcc actctacaaa ctactgtat ttgtgactaa ctccaaggt
 14761 ttgtgacttc agactcaaaa tgtgatttag actcagtttc ctcatctgta aacttagggc
 14821 ctctgggttc atgtgacctt tagggttacc ccgagactca agatcactga tcatgggagt
 14881 ccttttgtct tgcacattc cttgggtgtc atagggtcta actgaatccg agtccactct
 14941 tctgttactt aaaaatgact ccaattcaca gtgctacatg ggaagaatg ggaaagaatg
 15001 cgagagaatc atggttgttg gctgtggcta tagaagcatg tcagggaaat tctctctgaa
 15061 agagaatgag attcacagaa actcttatat ctaccacca ctccctacaa cttaggaggt
 15121 aggttagttt cctctactaa ttctcattct atttataatt ttctattca ttacaattgt
 15181 aatttgtcaa atataatttc tctgttaaac ttgtttggg gtttagattg gatcttagtt
 15241 ttattgtctt ttctctctt taactgagtc aattccaaaa tgtactactc ttctcttaac
 15301 ttagttttgt ttaattattt catctacttt tgtacattgc agccggaggtt cactgtctatg
 15361 ttaatacaat gccattttat catttaactg agaagcaca attaatacag ttcttctccc
 15421 catgaaact ggtgattaac caagctgtga cactactctt tgaagtactt tctaatctt
 15481 gctctgtatt tagtagttag gtgtacacat cagttttcaat cactactgac tgatcttagc
 15541 tgggtctgac caggacaatg gtctcttact ttctctcaaa ttgattctcat gatccgtaat

15601 attcttctgctt cctgttctgt tcctgggtta atgatatgtg aaggatttct ctactcttaa
15661 tctcagattt tcaaaagatat gcttaacttc tagataatgg tgggatttct cagacctcaa
15721 ggggttggaag tcccttgacta cgagtatatt tgctctacta ctttaaatgac atttgacata
15781 actcttgatgt aggatgtcag aattatgtgg tgaatgtttg gaatatatttt tggagaaatta
15841 attttttcag ataaaaacgca agtctgttgt agtatttcaa gatattatagag ttcaattatg
15901 crggaanaatg ttgtcataaa ggcctatgc atttagaatt agtgccatca actaaagtta
15961 ttctcatttt aataagatat aataactaga ggctttgtag taqctaataat ggaatacagg
16021 tgaagtgtga gaaagtgaca gacatctgtg attgtcaagg gaagtaatac gtttctggta
16081 taggcgtata ggaccaggat ttgtatgtgc tggtaaaact caggctctctc cgtataactt
16141 aatcagcttc tcaagtctcat tgataaaaaa aaattgggga ttaagttccc aaattcttcc
16201 ttcagatctc aagattactt tgaatcaagt attgctatac tttaaaggga aattattaga
16261 gcatttttgt attctctatt tttttctgc atttttcccc attttaaaaa tgcctgtgat
16321 tacttgaata gattcaagcg aagtgtaaac ataagatgac taagaccatgg tttgaaacta
16381 aatgtgatcg ggggagtggt tttcttttcc ttgaaaaacat tcaccatatt tttttttgt
16441 aagtagcgat actaccttta tatagctgaa gggctgtgtt ctaccattta gacggtgctt
16501 ggaacagaac accacgtact taaaccatcc ataaatttt aaaggtgtgt attatgtcag
16561 cagttaaccga ggggtggaacc actgcgtgct cagggaagta tatataagg atgctcttcc
16621 cacaccaaa gcatcaatat gtgtacttta gaatgccaag aaaaaattat gacctatcat
16681 gaactcaatt actttctttt aagttagtgg tctatcatct taggattatt gaactctctc
16741 gqatcttagt ctttctgatt ctctttgtgc gccaggctct gcactttccc aagtttttct
16801 tccataactt tgaactcttt tctctattt cccattacca gttcacacata atacttttg
16861 cataaaactt ttttaggaag ttgttaatac ttccacta tcttctctca tagatagttg
16921 atcagatgga ctgaatttta gaattctagta actttaaaga tgaagaattYt tctgtgtgtg
16981 tgtgtgagtt gcatctctcc aaacctcagc agctcttgca gctcttgagc catcaaacac
17041 agagattgtt gacatgtctt tggagtgagt cccgaacctc gaactgaac catcacacag
17101 tagctctcca gtgccccctc ccaacccagt gttttccag aagagaactct gagagacaga
17161 tggctctatc taggagaagt cacaatgata attctgatac tgtgctagtg gaaagagat
17221 cgagtagacc aggaataacct gaggagttaa gttggaaagg cctctgaaat tctctgttag
17281 atgtctagga ctacgtctct acttctctca ggtgatctgc aaattctatc atgaataacct
17341 tcaagggtta aaactattta agagaattaa caatgtgttt accctacacc ctccatttgt
17401 ttaatacacc ttacaaaaga caaagtgaag aaactgtgta gggtagtcta ttacttaaa
17461 taaagggaac ggagatatgc acatatattt acatatattt ttagctttt ttaaaaaagt
17521 gqaggataat aatttttttaa aagaaagtta cctgcgggtg gcggtggctc agcctgttaa
17581 tccaggactt ttgggagacc aaggtggatg gatcacgaga gatcagatc gagaccatcc
17641 tggctaaccac ggtgaaaccc tgtctctact aaaaaataca aaattagctg gcgctgggtg
17701 tgggtgacct tagtcccagc tactcgggag gctgaggcag gagaatggca gactatgata
17761 gqaggcgagc cttgcagtga gctgagatcg cgccactgcg ctctagcctg ggggacagag
17821 cgagactcog tctcaaaaaa aaaaaaaa aaaaaaaa aagagaaggat taccctttatg
17881 ataaactata ggggagggat agaacagaga cagaagctag actttttttt aacatgcctt
17941 gttttctaga ttttactgta gagtaataa cacaatttaa taattgta tcaaatataa
18001 tataaaagca tttctaaaaa gcaaaagtaa aaatggaacaa ataaactatt tgttgtttat
18061 tctcaactatt aagttgaagg cataaataca tagaaaaggaa ttatttaag tgacttttaa
18121 acagtaactct gtgtatttta ctgttttaga tccactggcc aaaaaaactc taagctactt
18181 tcaatgatac caactctgcta atgacagcca ttttttact taaaaatttg tctgtgact
18241 cagaaaacta tctctataaa gcagttattg gattatattg atattatttg aaataataat
18301 tttcaatttt agagaaaaaa gaagcaaatc taaaatcaga aagatgaaat agactatcta
18361 taaccctgtg tttgaattag atacatcaat atgaactctg aatatatttt ctcttaagaa
18421 aaatagaact atttctagt ttggtttatc taagactcct gactatgttt atcaagaata
18481 ctacaaggaa aaatgatctc tctcagacc tagactgagg gcaactaaata ccaactttct
18541 ctaaaaggat ctagaattcc ttgcagtaaa agactggatc caactcagac caacaaat
18601 caaaataaat tgggattact ttaaccaga aaaaagattt gtgtgcaag actactggag
18661 tgtgtctcaa aggactcagt ggttaatttg aaacagaaat cactggccaa atgaagtaa
18721 tgaacaatca ataatccagg aatggagctg aaacatcaag ttaaacatata atgaatgcct
18781 tatagaacaa acgctttctt atccactttt atgggaagat gccagagaat caactcatc
18841 gtctgaacat tggtttgtaa aaggaaaaat caagcattta tcccactttt ttttttttga
18901 tctcaaaact gcatctcagg gtaaccaaat atttattgaa agaaactttt ccatttttaa
18961 agcactccag gtcagcatac aaaatttaag aatgttagaa taactccatt ttgtaaactc
19021 caatgaaata atgtacctag agaacatcag tatgtgctca catgtgaaca catgtataa
19081 ggtagagggt acctggaagt agacaattgt tgcttcgaaa gattctgtcc aaagtctaa
19141 ctaccagttt atataaata cagggaacaga aaaaaaaa catgtctgca taatgttaac
19201 acagagggga acaatgagca aggtgggaaa cattatagaa caaagtgggc cattttttt
19261 tcaatagttg atfgaaagaa aaaggaagag tgatccataa tgaatgattt agagagaa
19321 gcaatcgat gcaacacatg taaaattttg atatccgat ttaaacataa tgcatcacac
19381 tatatctgac atatactttt aagagataag cagtcacag acagtctgta tgaacagaa

19441 cttattgtgaa atttttagatg tgacaattgt gtttttgttt tataaggaat tctcattctt
 19501 taagaatgaca ctttgagata ttacgcctg aataaatatg atctctggga ctgaatttaa
 19561 aataatcgag ttgtaaaagt gataaactgt gaggggacat ggggtgtaggc gaataataat
 19621 tggctctcag ttctgtctctg aagtagatg tgtgtgagtt ttaaatctctg tctctctaat
 19681 ttggtttcat gtttgaaaaa gtccataata aaaaatgttaa tgcagagtaa atgtttttct
 19741 ctttttaaat tttagtaaa gtctctcagtt ttgtttttt ttgtttttt ttgtttgtt
 19801 gtttttttt ttgtttattt ttattttatt ttgttgagat ggagctctgc cgtttgtccc
 19861 aggcctggag cagtgggcac tatcttggct cgetgcaccc tccgctccct accgttcaag
 19921 gattctctctg cctcagcctc ctgagtagct gggatagac gcagtcacca ccatgctctg
 19981 caaatttttt ttattcttgt ggagtagagg tttaactatg ttggtcagat tggctctgaa
 20041 atctctgacct tgtgatccac ccacctcggc ctcccaaagt gctgggatta caggtctgag
 20101 ccacgcgcgc cagccaagtt ccagttctta tacaatacaa cccaagcgag gattcagcca
 20161 ggctggcagt aatgagcacc atgaggacca agctgaataa aggatcaaga agaattcgaa
 20221 gtttggttgc tcagttaagg atgaaggag gccaccaca cccaagcgag gattcagcca
 20281 gctctgataa agtgccatgt agctttggtt gtgactgact tgcatttcat tctcccgac
 20341 ttggagagtg tgggatggag aggcactgat gagttgatta atctcctggg tacctacctt
 20401 aggaagattcc gcgctctctc ctacaggaaca gtcatgttag gcgattgaa ggtgcctgtg
 20461 tattagatcat gcttcatcat gaacctgaaa tcaccagttg tcatatagcc aggtcttaag
 20521 aattaatttt acaagcatat ataacacatt ttcaaatagg cttttatttt actacagttt
 20581 attatccata ttatagctc ttgtttttta ttccccaa atacctata taaggtaaaa
 20641 ttgaaaaagt agaaacacag ggaaatcata tttttcata catgagccaa agttgaaagt
 20701 tttaaaritt ttaaaaaatc aatgagttaa ttacagttca gcattccaac ggttgcaaca
 20761 ttttttgag gaaaaatagc taaggataaa atatagtgaa gatatacata tgaattattc
 20821 tgacacctga cagggtcaac ttataaagta tgaacagtt tcatagacag gacataaatt
 20881 ataaattatt aaagatctct tttttaaaca atataacgca ttgttgttat ttgcttgtat
 20941 gcttactcca agtttttccc agattttatt agagcagcaa gggctgtgag atgactagac
 21001 ctgattctca ctttccctga cagttatgtt ttataaagtt tccatggaca atgaattatt
 21061 aaaaactgaa ccattgctat gctatgtcat ctacagggga ctgccttagg agggactaga
 21121 gattgttttt aagataggat aaaaaactc ttgtttttta ttttagcaat ttgtattata
 21181 aattcaaaact tgaaaaatc agagaaaaa taacaaactga atttttctc
 21241 atgcataaatt tatttatata tagcaatgtt tcccttccat cttttctcat attatacaa
 21301 aaaaataaac tttaattaga agtgtgtgtg ttgtgtgtgt ttgtgtgtgt tagagagagt
 21361 gagttgattc tcattatgag tgaaaaatat gttctataaa gttcctgtga acactgaatt
 21421 agagagtagt gggtaaatc acaattagag tccogtgagc ctctgactgc acaatttag
 21481 tccaccctac aatcagtaac ctgtttttac gtatgtttct gtttaagac acccttatata
 21541 gtctgtagt ctgattttatt aatattgagc tcatggccaa cagcactata acctatgact
 21601 gaatgaagct tccctaacac atatttttct cgttaaggtc atggcagctt tctgtactt
 21661 aggaacataa ggcagttatt cagctctacg ttgtgggccc attttaacag gggaatcac
 21721 caaaaaatgc acaaaaatgt gaaaaatgaa tagataatga aaaaaaacac ttgtttacag
 21781 tattgtagct gaaacaggaa ggcagagtg cacttgttt taactcagtt ggaagcaggt
 21841 acgttgggca gccacagagc ttactgtgtg tgggcacatt ccacaaatgac cactgaagca
 21901 caaaaagctt tgatttgggg ttaaaaataa atcttagcta tagggcaaat taccacata
 21961 gtatctatga ataagtgaag agaaactgaa ttactattt gccctaaaaa taccattagg
 22021 gtatagatga gctctattat attcttgcca cgtcttttat aatctgttta taaaaaactg
 22081 cctcgggcaa aatagtaaaa tgagcaattt tttaaaagt gaaactgccc ttgtcctct
 22141 cagtgtgaca cattttttaa aaaaatttga ttgtctgtct ctgagtttgg gaatttgaag
 22201 accaaaattt aaaaatgcaa ctccaaga taagaatcat gcattttgtt gaaattgctt
 22261 tatgcttact ccagactttc ccagatttat tttagcagtg tagagcagtg tgaatgaac
 22321 agctgattac tgtcttattt acgttaatt tccagagcct aaactgtgtc taataacata
 22381 tgaggtactc aggagatact taggcacaat aagtgaattc taccttaacg taatataat
 22441 cccaccatgt tgaagtaga ggccttccaa agatgttca cacttaacg ttgggacctt
 22501 taggtatgtr atctctataa aaaaagcata ttgggttgt agatggatt taatttgtta
 22561 atcagatgat catagtaaga ttacctgga ttacacaggt gggccagatg taactccaa
 22621 gggccttaaa agtcaaaaga ggcctaaaag gagattcaga ggaagcagtg cctgttggaag
 22681 gagaatagag ttatgcaatc tgtgaatgac tcaactgtct ttgtgtgct ttgaagata
 22741 aggaaggag ccaataagcca aggaatttgt gcaacctctg caagctggaa tggacRagg
 22801 aatgaattgt ctcataaagc ctccaaaaaa agcatgcat ctgctgacat ctgtatttca
 22861 gccagatgaa acctgtgtca gatttttggg ccacagaaat gtaagtgaat aagtttgtgt
 22921 tgtttttacc cacaaatttt tggcaatttg gtacactcca tgcctgagaa atgatgatac
 22981 ctaccacatc gacattata gtcogataa tgatatacaa aatttgaaat tccattagga
 23041 cacacagcaa tgaattatta tatgttaagt tcaaaacatta tggtagagac tggaaactga
 23101 atttttagag aagctcaatc tcaagttctca aatctcata ttaattttgg agacattcca
 23161 taaaactgat tgaactgatt tgaatactt ttgcaaccaa tagtctctct tgcctttagg
 23221 tcaaaataat tgaatttctc tcatatttt gtcatatttg agtgcagagt aatttagtg

23281	tttatatatt	ttaaatcatg	tactaaagtaa	tagcttggtta	tttataaaaat	gtttataatc
23341	agggcttggtg	ataaaatag	gtaagatcaa	tattacagta	ctccaaaaaa	cgaaatgccc
23401	tctgaaactt	cagaattaat	gctcatgaaa	taactcagcaa	aggaagaatgt	aaaaattatg
23461	ttgtttttaa	accattgaa	catggacaaa	tatttaattg	catattgtca	gtcaacatga
23521	tttaaatagtg	gttttaataa	gggtgggtat	gttgtcataa	gaaataagat	gatatagaat
23581	acttatttta	cttccagta	tataggctgt	gctcaataaa	tataaagta	ttgcggttg
23641	ttttgaggat	gccattgtta	ttataatgca	aacacagaag	ggatctattc	ccctcttttg
23701	ttttctagac	tggttgaaaa	tattttattt	tttataaagt	attaatgtct	gtgaaaccc
23761	aatactatgt	aaatatttgt	catttaacggg	tgcttgccag	tctattttgc	cccatactca
23821	agggttttgt	attttaccat	cagtcactga	cttgagagaa	tacatgaaaa	tccaccttaa
23881	gtgtgggtgtg	gttgtgatta	ctttacaagt	tctactttgt	tggtatttagc	cagatcagca
23941	tctttgtgtg	tcagagacat	tactgggaca	tttacccaaa	gagttcatta	cgacactgtt
24001	gttcatttca	tccatcctca	gaaaggcagc	agcatcqlgg	agtgccagga	atccactctc
24061	agaggaaagc	agtggttttct	aaacattggg	accataatca	aaatgaaaaa	caacaaaata
24121	aaaaacaact	tttctccaca	cagcaaaata	ccattcttct	ttactlgagg	cagtaatgaa
24181	gtggttttga	aaacctttgaa	aatgagcatt	gtgtagaata	ttgagtaaat	cgattttgaa
24241	caaatgaag	aaacattgat	atggatttct	agtggttctc	ttaatgtatc	agtcaatcca
24301	caacaaggta	atgcacaca	aagtaaacaa	acaaaactta	agctatctaa	aagtcatctc
24361	ctgtataact	gtgattttga	ataatatttt	atgcataagt	tctgatata	aaatgatttt
24421	ctcgttataa	acacataac	atctattgat	ttatgctgt	tctatgctag	cgaaatgtct
24481	agacattttt	gatcatctca	gatatttctt	atgtaaatct	aaatgaggtg	aatgttattt
24541	attgatattt	tacatacaag	gaaatgggaa	tcagagactt	ttgtaggctta	tataattaa
24601	cgagttacctg	actccaaagt	acaagtctgt	cccaacatgc	tctgtctcca	ttgtagaatt
24661	gtctttgtgt	tgctttaaat	tataattatt	aaacaaggag	tctgttccct	ttatgttcca
24721	ctagagaaaa	ggaagtaatt	tctttaaaaa	aggagaaaaa	cttacaatga	catttataat
24781	taagtgtata	tatgactaag	ccaaaaacct	atgtcattat	ataataaaga	acactgtctca
24841	gtatataacta	gagtataagt	atgtgtaaat	atattgtcac	gttaggaaat	aaggaaaatg
24901	aatattgaata	tattgttagag	aaactcaaat	gttaggaaat	gttagccag	catgtgagc
24961	agaacaaagt	tctctgatgt	gtgctcagcg	aatgcataat	gttccattgt	tctcatatag
25021	atgttaagta	ctgtgctgca	ctcacaacac	ggcatgtata	cacgtatcaa	caatgcatgc
25081	ttagtctgtt	ttgtactcgc	ctctgaaact	aatgtcaaat	caatgtcagc	gaattcttgt
25141	tgacagactt	ctcggcaacg	ttgctgtgtg	ctctctctcc	actcagcgct	cgactgagtc
25201	tgttttagttt	tttttggttt	tgogtttttt	gttttggttt	ttgtttgagac	agtatctccc
25261	ctctttgctc	aggtcggaat	gcagtgcagc	gatctcagct	catctcaaca	tccctactcc
25321	gagttcaagc	aattctcatg	cctcgccacc	tgagtagaca	gggattacag	gaattgtcca
25381	ccaagoccaa	ctattttttt	ttcttttttc	tttttagtag	aaacagggtt	tcgccatttc
25441	gtccaggctg	gtcttgaact	cccggtgctg	aatctcccat	ctgcctgact	cagcctccca
25501	aagtgtctgg	attacgggcg	tgagccacca	catccagcca	acagtgtgtg	ttatgggaac
25561	ccgatctcag	aatagtgccc	tattctgtcc	tcagatattc	taattctctc	ttctaatatg
25621	ctaccaaaaa	ccacatgttt	tagtttgggt	ttctctagaa	gcgaacctg	agacaagaat
25681	ttgagtgcaa	gtattttatt	tggaaggcaa	tttcaagaaa	taacagtagg	agggagggga
25741	agtgagacaa	gtaagggaaa	gtagttaata	aggtttgcga	tttgaaccaa	tggaagcttaq
25801	ccccactggg	gaattctagg	agccagatata	cttcgccatg	tctcaatgta	tccatcagag
25861	gagcaaggga	gctgggggtat	ttatccatca	ctccaggcca	gtcaactgat	gagagactag
25921	ctcttcctccc	tgggagatgg	acaaagccgt	caggttaact	gtgcaactac	tgagtctgtg
25981	actctcagca	gatgtttctg	aaaatggcaa	aacctccagg	tatatgtgtga	agagtggcca
26041	tctcttacta	cagtaactta	tctattgtaa	ctaatgttaa	cttatctatt	gtagtcaatc
26101	tggtggaagc	ttcagttctct	ttctttatcc	ttgccttaga	ggcctgtgtg	agctgggtta
26161	tacatagaag	atgggggtct	ggactatabc	cttttgccag	gacacttgct	tccctcaata
26221	aaacccacat	gtaattgttt	cctctgagaa	aagctgggtg	ttctgtctc	atccagcggt
26281	cacagccagg	gaatctgttc	atgaactgca	acttaagtct	atctctctg	gccccataaa
26341	tacaaggtaa	aaaaaaaaaa	agccctgctt	gttttaagca	ggcatatttc	ctctcaatca
26401	ttgcatctac	gattcaaaat	gaaagcctgg	aatgtggctt	ccaggttagc	tctctaccca
26461	aggttgctccc	tgcccttatt	attatgaaac	aatctcagga	tttttattg	atctctatga
26521	ctctttgacct	ctcttagcta	acttgaatct	ttcaagcact	tctgggtttg	caactatagga
26581	ctttaccctc	ctcaagctct	gaatttcttt	taattctcat	taactgtttg	ttttcttttt
26641	taaaaaattt	tttgtgggta	cataatttgt	gtatataatt	atggggtaac	tgagatgttt
26701	tgatatgggc	atgcaatggg	aaataagcac	atcatagaga	atgggggtca	cttctcatca
26761	agcacttact	ctttgagtca	cagaccagcc	aatatacaat	tttaagttac	tttaatatat
26821	acagttatata	ttgactatag	taacctattt	gtgctatcaa	atagttagtc	gtattctttc
26881	taactatttgt	tttgtacaca	ttaaactatc	ctactacgac	ccccactaac	cttcccaatc
26941	ttttatctat	tgatgttgac	agcaaatcac	actgaactgc	ggccaaagtg	taaaagtgtc
27001	tcccgcctct	ttgcataatg	tgaggagcca	aatgtgtgtg	acacttctct	catatgaact
27061	caaatgtttc	catttgacgt	ttcacatctc	ttattatttt	ctgggggaaa	agtcacacca

27121 cctccaaatgt tcttctccac cagccacagt cttctctaatt tgaactctgac ttgtagaat
 27181 tgcctaactgt tctttttttg gaatgttcca aagcatctatt tcttaaaata tcttaaaata
 27241 tccgtttatgt caaaactttg tgcctggcct agtaaaataa gatctggctg acattttatg
 27301 ctaacacagg ttgtcttgta tgcatttcaa catctaatac agtactggctg agtataatga
 27361 tcaacttaaga gcttctgttaa agtgacagat ccaagatccc accctcgatc taaccaataca
 27421 gaacctctga ttgtgggggtc caggaaacagt gtgtgaagga gcttcctcag tgcattttga
 27481 tgttccatcag aagctttagt aacacaattc tatagctttg ctactcaatg tctgttttca
 27541 gcatcagcat catcagagag acaaaaacttg ttagaataac aggatctcag tgcactgttc
 27601 agagctctgt agtcagaatc tgcattttaa tacgataccc gggttaattca cgtgcacacc
 27661 caagtgtgaa ttgctctgtt ccacaggaat tagtctgtat ttctcagttc aataaataat
 27721 acgatgtatc aaattattca atataattag cattagataa gtatccataat gtgtttgttt
 27781 ttgagacaga gtctccctct gtgcgccagg ctggagtgaa ctggagtgaa ctcggtctac
 27841 tgcaacgagt tctgctctcc ggggttcaagg gattctcctg cctcagcctc ccaagaagct
 27901 gggattacag gcttctgtcca ccacacccag ctaatttttg tattttttag agagatggg
 27961 tttactcttg tttagcagggc ttgtctgtgaa cctcagacct caagtgatct cctgctctg
 28021 gcttcccaaa ctgctgggat tacaggcatg agccaactgt cctgggtctt gctgttgtg
 28081 tttaaatgga gagttatYgt aggaaaatgt tcttaaacat aacacacccc aaagaataat
 28141 caaatgtgac tcccaaatca ttggaaagcc acaaacctgg atattaagta tctgacatga
 28201 gtctcaagaa agaaaaatag ctactagaga aataagcata cagaatctcg caaatctact
 28261 tcttactcca ttatatatat ttttttcaag aagacaatgt aagaactact tgaatgattg
 28321 gaacacgttc tttaggaaat ggagggaaat atgtcccttc accacatgta ttgcagagat
 28381 ttttttctca ttggaacta gcaggtctgc tcaagtacat actgtcattc gggaacttga
 28441 cctcagtcga acacaaagaa aacataattt tttcttgagg ttgttgagctt ttagggagga
 28501 gctctttttt gaaataacaa agggacatgg aattttgatt cttgactcttc gaactgttcc
 28561 tcatctacgt ggacagatt cattttctgt gcaaaagatgt cccgagctc acagcttgaa
 28621 gctgYgtgc aatgaatgaa aggtcgtgc agctcgagga gggaagctca tgaacttaca
 28681 ccagagctcc tctttatata cttgccatgc ttacgctct tgcattctgc ctccactgac
 28741 aggttagtgt tttagcataa gggcttatca tttttatcgt aagtattttc atgactttaa
 28801 caagcacaaat tgtctaaatt gtattctgac attgagctag tctttctctc gtYttttga
 28861 acatgactct taYagattct ccaccaaat ccaccaactc attcaacctt ttccattag
 28921 gaaacaaaca aacctctatc tagccttctc ttatggttgc tatgtttatg ctacagctac
 28981 gatgatgtt ttactaccca ctgaaaagct ccgctctatg tctatataag caacatgta
 29041 gaattgatta gtgaaattca gatgtggcat taatcatatc taacttactt ccaagatggg
 29101 gtcaacaaat cctccctact ttatatgctg tcatattctt tgaactgtta ttccccag
 29161 tgacaatgat agcaacccac attgcttaag actatcattt tggaaattat atatctact
 29221 agtcagttct tactgaacac tgggcattta tgatgtgtg ctgaagtac agagatgaat
 29281 gagacacagt cctgggcccc aaagtgtctc cagcctcttg gggcttagag cctgcgaat
 29341 gaatggagat ccttgtgacc cagcacagag agtgccctaa ctgctctgg gatgaagag
 29401 gcatcagcaa ggaattcatg ggggggtggg gagaggagga ggaatgaagc attctggga
 29461 gaaaaaaa aaattgaaag actcccatg tggggcagag ggtactctgg gctgtgttcc
 29521 ccacttttct aagaagagac ttacgctcgt ggtgtcatga gaacatgca taaactatg
 29581 aggtcctgga ttgtctctca gagaactgtt ggaatctacca aagaactca aatagctta
 29641 acaattaggg gcttcaatga attcagagaa aaataatgtc aacacaaatg cttratttca
 29701 ttctgcgcaa cagaactctc attagactgt gaacgtcttt gtgtgtctaa tattttccct
 29761 gctgggtttt cctttggata ttgtctctca tggggatgaa aagctctgac caagcatgcc
 29821 aaattagaca gggagaaaag ttatgctctc ttattatggc aagctctgctc ttaccacaac
 29881 cctgaaaatt catgaggaaa ttgttatctt taaataatca actatcatt ttgcatcat
 29941 ctgtagagac ttctgactgg ttggtagaat agagtgtgtc aggaatgttt atttatttt
 30001 gaagtctggc ttgagcaagt tacttagtgt gtttaaatgg ggtttattct gtaaatcaca
 30061 gatctctgtg cctttacttt gattgatatt ggaagtgga gatcttggaa tactactcaca
 30121 cgtacacact tcatagtgtg aaaaagctaa aaaaRgcata tatgtctctc taaatgttaat
 30181 taactgtgat aaaaatggaa aatcttgcat ttactggtat tgaattataa ttaaaattt
 30241 atttaaatga tgggaatata actttaataa catgacacag aaaaatttt cctaattttc
 30301 actaattcct agagtgtggt gattagagt aggtcttttt cccctctctc tttccccca
 30361 aaattctata acgtatttaa gtgaggttta taatgaaagt tttaacttat taaactact
 30421 attcaaat ttgaaagaaat agttttatgt aaaaactc aactcaact caatgtcag
 30481 taaatgttta attcaattaa aatgttaatc atgactctgt gatttctgtg aatcattccc
 30541 aaatgaacgt ttgacaactta gaaggaactc aatctctctc ttatgtctct tctccccag
 30601 atcttctctt ctgaaaagt gctcaagtgt ttatggctct gtgactctct ttttccacc
 30661 caaactaac aggtcatagg ttctgtttac ttgagctctc atagaaacac taggcaattc
 30721 gtgataccag gatgaatacc ttctctctga ttgagaatta atagaaacac ttgaaacag
 30781 ggtgggacca gaggccttaa acattctctc ttctgacaca aatgtYatg atgtgaagcc
 30841 ttacttctg atgcgaaaac gtgaactccc caatgacca catgcaaac cctgtttgaag
 30901 aattggggag aggtctcaga aggtctcaga gagatcaca cctgtttgaag cctgtttgaat

30961 cagacttgaa gctgcttaga gggcatcagc agatttgata ttattataatt tttttaacct
31021 taccacttat caggccaaaag attctttttt ttttttgag attcagctctc tctgtctctg
31081 caggcgttga atgcaatggc gcaatcttgg ctcatttgcaa cctctgcctc cagggttcaa
31141 gcaattctcc tgctcagccc tctgagtag ctgggattac aggcacgtgc caccacactg
31201 ggctaatttt ttgtattttt agtagagatg ggggttcacc atgttgccag tctgggtctg
31261 aactctgac ctgtgatccc acctgctcca gctcccaaa gctcagcgtg cagtagccgtg
31321 agccaccgcg cccggccaaa gattcttaaa atagggtgtg ataaattatt ttattggaaa
31381 aaaaataatt ttataagtat cttcagtaaa aatcaatgta ataaacacc attaggcagt
31441 tctatttttg tcacacaaat cggttaacagt caccagcctc actgtgtccc ctgaaanaag
31501 ccttggaatg tttttttttt tcgacaaggt ctgtctctgt cgtctagcgt gggatgcgtg
31561 ggagtgatct cagctcactg taacttccac ttcccgagt ccaagtgtcc tctgtcctca
31621 gcttccctag tagctaggac tacagggtgtg tcccacaatg gccggttaat tttgtattt
31681 tttagtagaga tggggtttca ccatgtttgg caggctggtc tcaaactcct gacctcaggt
31741 gatctgctgt cctcagcctc ccaaaatgcg aggtattacg gcatgagcca ctgtgtctag
31801 cctggatggt ttttattaac ctgaacagtg gtgaaaaata aaataactctg gaccataaat
31861 aaggaaaagc ctcaacatca actaaacac agataattat aaatgactll ggaggtgtgc
31921 attcatttct aaattttgct ttgttagacc ttaggYgttt atatagctaa aaaagtcag
31981 gggatgact cacttgaatt gtgcataatt atttgccatt taattcaata aagacaagaa
32041 aatgttatga ttgcagtaac agtttactgt gctgctcaca agccagacac caccagaaac
32101 acacctaag gcacactlaag ttggccatac taccggtgc aagggacagg atgcaccta
32161 tgtgagtata ctaattttta tcaaggaggt aggaagaatg gggccaaact aaactgttaa
32221 tgggtgaaga gtagctgttt actcatgcta accaaagagv tggatgtcca gctactttgc
32281 tggtttagac attactttag ttttgactct cactcagaca tggatcacaga tctgttttgc
32341 tttgtttttg ttccattaca gtggaagaat gacctgtgtg ggtgctgggt gctgtgaaa
32401 ttgYttatat tcaatagtaa aacatcatcc tcaactcagc ctgacagtgg tcaaggagctg
32461 tctccacttt gtgcagcat cttaacctca tgcctactgt ggtgactctg cctatgcaa
32521 gctgcacac acatcgctga ctgttcaaca ctctctgcaa agataggagg catccttctt
32581 cccaatgtgc acatacaaca tccacatctc tcagaagtct ggtgactctg cctatgcaa
32641 acagaaaaag actaaagcta tttatcacaa gaataattag gtaaatagtt aaatcacaa
32701 gaacacacaa gaagcttttaa aggaagcaga cacataaatg gttgagggaa accagagaga
32761 cttatgggac tgcatacatt gggacttaag caatggagag gaattcaata agagctctca
32821 tgggtgtggt gcatcaggga aggtattccag ctctctattg tggtaaacat gcgcgaaga
32881 cccagggggc tacaagagaa agaacaacaa accttccag gacataaagg aaggcttat
32941 gtcRtaggtt atacctgaac caagagtcca aaggcgagag caaagtttcc aagcagaga
33001 tccatggatt atgctggggt gggggttggg tggtagaaga caaaaaatga acaatagaaa
33061 ctgagaaaaa ttgtggggtg tgacagtcag aagaatgcta agtaaccat agctaccaat
33121 gtccaggaaa ttatgaggaa agggattaaa tcataaaggg ttaaatltca gtgagaatgg
33181 gacaagcaga aacagtaacc attttctcct ttcaaggag tttagaggag gaaggcatgc
33241 gacagagaga aaagaagcct tggagtgtgg agacagcaca catcagatag cgagtgggtg
33301 ggtttgtttt cattattatg catttctagg aacagaatat atagcaactg ttacatacct
33361 aatggtagca gtaaatattt aacaattaac atttaacaa cctctggatg attctgatg
33421 atactaataa aagagaacct ctgtatgcta gaaataataa ggctcgacc attaagact
33481 agtgctacag tcaattcata aatctgtcat ttcatgaata aaatttcatg gtgtgaattg
33541 tagcattata agcctttatgt gtgctgtgtg gtgtgtgtgt gtgagagcaa
33601 ggaagagatt ttcatgttaa aggaacctt tagagggaca gaactaatag tatataaca
33661 ttgttttagc atacataat tagggttctc tagagggaca gaactaatag tatataaca
33721 tatatatata tatatatata tatatatata tatatatata tatatatata tatatatata
33781 tatataaga atttgactc acacaactag aaggtgaggt ctgcaagctg atagagcaag
33841 aagccagccc gagtcccaaa gctgaagaac ctggagttca atgttttga gtaggaagca
33901 tccagctgtg cagaaaagaa taggccagag ctgaaccca actaaccag cttagttctt
33961 ctgctgctt ttattctggc catgctggta gctgattaga tgggtccacc tctgttttgg
34021 gatgggtctt tctttccag tccactgact caaatgttaa tctcctttgg cacaaccttc
34081 tcagacacac ccaaggcaa tactttgcat ccttcagtca atcaagtgtg cactcaatat
34141 taacctacac aatacatgag aatcatocaa aggctgttta atgtgttgcg atagctgat
34201 tctgtcacc tacgtgtct tccatccca cttttccagc catggaacct actgtacttc
34261 tcaattctcc gccaccgcac tgaaaaagc agtcatatgc acgtccactt tacaatgtg
34321 tcagaactac tttagatag gtaactggag acacattcac taggtagtat ggtatacaaa
34381 tactaaaaat ttactacat aacatgaggg gtgcccgtcaa agagtattaa cagtgtacac
34441 tcccaccctc aatcagtgag ttctatatac cccacatttg tgcacaacaa tgtactatc
34501 caactctctg attttgacag ctttttaagt acaaaagcct atatttttta tctttttaaa
34561 taattattgg tgcataataa ttgttatata tacatatatt tacaatatata tacaatcaca
34621 tactttataa ttatctcac ctgtgtatat ggtttggctg tgtctcacc aatactcaca
34681 ctgaaatgtt aataatcccc cctgtgtcaa gggggggctg aggtggagat aattgaattg
34741 tggggcagtt ttcccatac tgtctctgtg gtatgtcaat agttccacc gactgtatg

34801 ttttataaat tgggaattccc ctgcgcaagc tctcttgccct gccaccatgt aagatgatgcc
34861 ttttgctctct ctttgccctgc tggcctgatt gtgaggccctg ccagcccatgt tggaaatgtgt
34921 agtcctcttaa actgcctttcc tttataaatt acccaattctc tagtbtggctt ctatttagacg
34981 catgaaataac gactaaataca ctttgctaac tglgtagtct tggataaattc actctctttct
35041 gagtttccagt tctctcatca gtaaaatgaa gaaaaattaa gtacctctga tagaaaagcc
35101 atgaaatgag atgatgtgtg aaaaagtaatt cacatgagct ctgcaaaagca ataaagctacc
35161 aaaaatgatta tttgttttta tctcgggatt tgattaaaaa tatttRttct caaaaaggcaa
35221 atttttYtaa agtactttagg gaactgaatt ataagaaaaat tgcataattat cagaatttcag
35281 tttgggggata ttcttatgag atttttggaa cccacaggga gagatcaaga atacctacac
35341 agttgcacaat gtccaggtta aggggaatttt gglaaaggaa aggactaact agtagtaact
35401 aaaaagagtat cttttgcatt tcttttttgc tttatagttt ctggtgtata tghtaacata
35461 cattaaaaac tggtaataga agttaaaaag aaactataa tcttatcact taaaagcact
35521 gctgtatttaa aactttgatg catcttttgt taatgctaac tgaataaattt ataatgatgc
35581 tgatcacatt agtcatgtat cacacttaac taatgaagag agcatgctaa ttttctaata
35641 gtctctgcata aagtcatttt aattgcttca taatttcca tcaagtacat gtbtgcggg
35701 taattatatt ttagtgctct ggactagaaa gtaattcagl atctataaaa atgtaaaaga
35761 ttaattatata atacaaacta Ytttaatacaa atggattgag acaggttagc atactcttag
35821 gtatagcaat gtgcttaata ataccttata ttgtacagc cccatagaga gtaaacact
35881 tcaagcagcc ttgtgatctg gaccgtctgg gtattactgt tatgtttatg atgaaggagc
35941 cagtcaagcc tatgtgttta agaatttgcc tttagatctg acctttgcaa gagccaata
36001 tggggtgcaa tbtgatgttt tgatacttat atacatttgt gaatgatgaa acatattccat
36061 cacctcacat atttttltgt gtgggaacat taaaaatcca ctactttagc aaatttgaata
36121 tatataaat attgcattcc ataaatatat acaattattt gtaattttaa aataaaaaat
36181 cttgttaaatt taaattccct acagatgctg gatattaggc tctgtctcat tgcagtattt
36241 gcacataatt tcttctattc tgtaagtgtg ctgtttattg atgattttct ttgtcttgc
36301 aaaaacttcta attttaacta gatccatttt gtcaataatt gattttgtcg tgattgcott
36361 caatgtcttt gtcatgaaat ctttgcccat tgatgtcca ggaatgggtt acctaggttg
36421 tcttcaaggc ctttttagt ttgggatttt acattttaaat ataaagcca atttagattg
36481 accttttgtat atgggttaag gaaggggtcc agtttccgtt ttctactatt ggctagctgt
36541 ctatctcagc actatttatt gaataaaggg tcclttccac gtgtctgttt ttgttagct
36601 tcttcaagga tcagggtggt gtatgtatgc agccctattt ctgggtactc tgtcttctc
36661 cactgttcta tbtgtctgtt tgataccatt acctagtggt ttgtgttact gtacagtact
36721 agtacagttt gaagtcagat aacatgacgt cccagcatt gtctcttgg attaggattg
36781 cctcggcttt ttgggctctt ttttggttcc ttatgaactc taaaatagtt tttctactt
36841 ctgtgaagaa tbtcatgtgt agtttgataa caatgattt gaactgtac atgtcttgg
36901 gcagtagccg cattttaagt atagttagtc ttccatctca tgagcatggt atgttttcc
36961 atttgtcatg gtcatttctg atttctttga gcagtgtttt gttactctca tgtatagat
37021 cttltgcctc cctgggttagc tgtattctca ggtattttat tctttltgag ttaattgcaa
37081 atgggatgtg gtlctctgatt tggctcttgg cttgggtctt ggcgttatt ggtgtatag
37141 aatgctagtc atttttggac attgattttg tatctcaaga gtttgcgaa gttgtttacc
37201 agctgaagga gcttttgggc tgagatgatg ggggtttcta gatataaga catgtctcat
37261 gaacaacgga atagtttgac tctctctctt cctatttggg taacctttat tcttctctc
37321 tgcctgattg cctcggcaga cttctgatac tatgttgaac gagagtggtg agaggggga
37381 ccttctgtctt gtgggtggtt tcaaggggaa tgtttccagc tgtgcccat tcaactgta
37441 gtgtctgtg gtgttggcat agatagcttt tatltgaag tatgttccct caatacctag
37501 tttatlgagg attttttaac tgaaaaggc ttgaaattt attaaaaggc ttttccacat
37561 ctattgagat aatcatgtga ttttgtctt tagtttctgt tatgcgatga atcacacta
37621 ttagatttga tatgttgaac caaccttga acttctctat tgagattgaa tctgttaat
37681 gggatttgc ttgaaagtgc tctggattc agcttgaag tatlttgtt aggattttt
37741 tcatcagttt catcaaaaat attgtctga agtttctcat ttttctgtga tcttccgac
37801 gtttttgtat caggatgata tttaacctat agaataagtt ggagagaagt cctctctcat
37861 catgtttttg gaatacatat catltgggaat ggtaccagct cttcttctgt acttctgtc
37921 aattgagctt tgaatccgtc tggcccttlt tggctggtag gctgttatt actgattcaa
37981 ttttggagct catatttggt ctgttccagg ttttccagct tccgggttt tccgggttga
38041 ggctgtatatt gtccaggaa ttagccatct caggttttct agttttgcta tgtataggtg
38101 tccagagttag ttctgatgt ttctgatgt ttctgatgt ttttctgtg actgtcagtt
38161 aagtatctcc ttgtcactt ctaatttgtt tttatttgat ttttatttat tttctcttta
38221 tlaactagc tagcaaccta tcttatcaat ttttattcat ttaactaata aaaaacacac
38281 tctgaatttt gt tgaacctt tgaatggctt tctgtttctt gatttctct agtttagctc
38341 tgaattttgt talttcttgt cttctgttag ctttggggtt ttttctctc ttttctctca
38401 attatttca ttgtgatgtt aggttgttaa ttttagatc ttaaacctc ttgatggggc
38461 attgaagtcc atgaattttt gccctagctg cgtcccaag atctcgttag gtcgtactt
38521 tgttctcatt agtttcaaa aacttctga tttcagcctt aatttcaata tttatgaaa
38581 aatcattcag gagaatggt ttttaattcc atgttaattg atgttttga ccgattttg

38641 tcatgtcttct gtttttattg tgcgtgtgtc gagagtgtgt tttgtataag tttaggttctt
38701 ttcgattttc tgaagattgt tttatgtgca attaagcaat caattttaga gtatgtatga
38761 tttgacatag ataaccaact atattcttga gtttttgggt gaagaaaaaa acaactccat
38821 taagaacgag gaaaaggaca tgaacactgt tttgtttgtt gggttttattt tttttttttt
38881 ttttgagagc aagctctgct ctgtctccgg ggcctggagt cagtgccgcq attctgagtc
38941 actgcaagct coactctcca ggttcaacac attctctcgc ctacgcctcc ttgagtactc
39001 ggaactacagg cacttgcacc cacactggcg aaattttttt gtattttttg tatagatggy
39061 gtttctattg tttagccagg atggtctcga tctctgacc tctgtagcca cccactctga
39121 cctcccaagg ggcctgggatt acagggttga gccactgcgc ccagccgctga acacttttct
39181 aaagagctgc tatatatggc taacaagcat atgaagaaaa tcccaattac actgatcatt
39241 agagaaatac aaatcaaagc cacaatgaga tatcatcca cacaaagtcag aatggctatt
39301 attaaaaagt taaaaagtaa cagatgatga tgaggttgca gagaaaaggg aacattcata
39361 cactgttgtt agggatctaa attaatccaa ccatttgtga aaacagtatg gcaattctcc
39421 aaagagctaa gaacagaacc accatttggc ccaacaatcc cattactggt tatgtacca
39481 gaagaatata aatcattcta ccacaaagac acatgcacgc aaatgtttat tgcagacta
39541 gtccacaatg caaagacatg gaatcaacat aaatgccat aagttaacaga ctggataaag
39601 aaaaatttgt acatatacat cacagaatac tatgcagcca taagaaaaag atgagatcat
39661 gtcctttatt ggaacatgga tggagctgga ggccattatc attagataac taatgtaaag
39721 acagaaaaac aaataccata tgttcttata agtggaaagt aaatgatgag aacatataaa
39781 tacaaggaaa ggaacaaagg acactggggc ttacttgaga gtggaggatg ggaagtgaag
39841 gacgagcaga aaaattaaact attgggtacc aggcgttaata ctggggtaaa aaataaact
39901 gtacacacatg agtttatata acaaacttac acatgcaccc ttgaacttaa actgtaaaaa
39961 aattcagtaa agtaaatggt gtataataat ttgacatgaa attaaaaagg taaatgtaaa
40021 tgcacaaaga aaaaaactaa agtcaaaaaa attaaaaaat aagaagacac aactatcata
40081 aaaagcatac caggatcacc gagagtattt tcagaatata cacttccctg aagataataa
40141 taataataat attccagttc actctagttt ggtgacctct tacagagaac atataagaca
40201 tgcattacaca cacacacaga cacacacaca ccaaaaggag tcaattattg gactctttc
40261 tccactgcatc ttcttaata caactcattc ctacttetta actgtaaaaa cttaagtatg
40321 ggctaaccaa gggctcgaat tagaattctc cagcataagt gagtgttttg aaaaattgat
40381 aaattgtctg taagtttctt aatacatata gaactcttat atgaactctc gtaaacactc
40441 ttgtgagcat gcaatgaata atacatgaaa ttgcttataa aatlaataga caatgtaag
40501 atttaataca aaaaattgta atgtaagcac tcacattttg agactctcaa aatttatgat
40561 aatggcttct tgctaatgaa tttaattagt accacagita ataatatagt actgtatat
40621 tcaaaaattgc taataataa tatttttaat attttcaaa atcaaaaaat atcaataatg
40681 aggtgatggg tgtattcatt agcttgatta actctttcta caatgtatgc aaaaactcaa
40741 acatcacatt gtaccccata aatatgcaca attatttgtt gtaaccttaa aatagataaa
40801 tcaaaaaaac ttatgacaaa tgtatgata atgcattgat ttcaaatgag gaaaactcatt
40861 taatttcttg aactctgaat agaaaaatgac acagaattaa gatttgtcta atgtatttgt
40921 taaagatttt ctacttgata gacttgtttt cactatgaca cttaaaaca cttaacctt
40981 gctatgaaac ataactatg gttacattat tctagagacc acttaaaaac catgcgagta
41041 ttgtaatgtt tYtttccagc tagctattta gatctgatca tcaataattgc taagtataat
41101 aaaaacaggga attgcaactt tccaaaatcat caattttcaa ataaattttg taactgtttt
41161 ggcataacaca gggagggagg gaaacccatg caatgaaaaa ttcatgtata acctttgata
41221 ccccaaaaagg gtaactgcta atagcttact gttgaactga agctattttg tttttgtat
41281 atgagttata tactgtattc ttacaacaaa gcaagctaga gaaaagaaaa ctgtagaata
41341 atcataaga agagaaaaaa tacttactct ttactaacta gaaatgagta atcatagaat
41401 ctctactctc attgtcttcg tgttgtagtag tctgaggagg aggagggaga ggaggggtg
41461 gtcttctgtg tcaagggtgg cagaggcaga agaaaacctg catatattgt gaccctcaga
41521 gtccaaaacc atgaggttca ggggtcaact gtattttgga aacatatgca tagcatgtaa
41581 attgtctctc ttttttttca catagctaaa gaatatgact tatagaaact gatatttta
41641 tgaacaataa tcaattccta ttactaaagt aaatacgttt ttgtgtctga ttagaagcca
41701 ttaagtgtgg ccagggtcag tggctcacac ccactttggg aggcagaagg cactatgtg
41761 aggcagatcg cttgagctca ggaattttgag accactcctga gcaacttgtt gaaactatgt
41821 ctgtacaaaa aatacaaaag aaaaaaattt agtcgtctca gcttgcttcc agtcagtgtg
41881 ctagtattcg ttatgtctat tttaacaacag catgtgtcca ctttgtgtct cgtgtcaca
41941 ttttgttaat tcttgcaata tttaacgctt ttactaattt atatatgttt accgtgtatg
42001 gcaatcagtg atgtttgatg ttactattgt aatatcaagc cacaaaacct gtctatctc
42061 agcagcaaac tttaattgata aatgtgtgtg ttctgactcc tccaccaact ggctgtccc
42121 gcatctctct ctctctctct ggacctccct atttctcag agacaaacct atgaaataa
42181 gaccaattaa taaccttaca atggcctcta agtatcaag tgaagggaag agtcattgtg
42241 ctttcatttt aagtcaaaaa ctgaaaatga ctgcacttag gaagcatgt tccaaacaga
42301 taagcagaaa gctaggcttc ttgcagcaaa catttgtaa agtttgtgaa gcaagaaaa
42361 agtttgtgaa gagaataaaa agtgctactt cagtgaaac atgaatgata agaaagtga
42421 ataaccctat tgcgtgacg aagacagttt tagtggcttg gatgaagat caaactgacc

42481 actcatattcc cttaaagccaa agcctgatca aggccttaag ttctttttcaa ttctatgaag
42541 gctgagagag ctgaggaagc agctggaaagc tagcagagggt ttgttcatga
42601 gggttcaagaa aagaggctgt ctccataaca tagaagtaca aggtgaagca gcaaatctct
42661 aggatgaagc ctgcagtaagt tatccagaag atgtagctaa gatcataagg aaaggtggct
42721 acactaaaca acagatttttc agcatagatg aaacagccct ctattggaaag atgcactcta
42781 gaacctttcat agctagagag gagaagtcaa ttgttgacct caaaggacacg ctgcactctc
42841 ttgttcagaga ctaatgcagt tgggtgacct aaagctgaaga cagrtgcctac ttaccattct
42901 gaaaaactcta gmacacgtaa gaattatgct aaattcttct ctgtaaagca tagccattga
42961 acagcacatc ttgtttgcaac atggttttact gaattattga aaccacctat tgaagactac
43021 cgggtccaaa tagtctgctt gctttggcct cccaaagtgc ttgagttaca ggcgaagagc
43081 actgtgtcta gccctttgtt ttgaagaaat acatttttga aggctatagc tcttattgat
43141 actgattcct ccaattaatc tgggcaaggt aaatttaaaa ccttctggaa agcagtcacc
43201 atcctagatg ctattaagaa cattttgaac tcagttagaa aggtaaaaat atccagact
43261 atgggcatct ggaagaagct gattccaacc cttagggatg acttttagggg gtrcaagact
43321 tcagttggag aaggaaactgc ggtgtgtgtg aaatagcaa gagaactaga attagaattg
43381 gagcctaaag atgrgactga attgctgcaa tctataata aaacattaat ggttagggag
43441 ttgcttctta tgaatgagag aagaaagtgt ttcttgaga ttgaattctac tccctgtgaa
43501 gatgctaca acatagttga aatgacaaca aagatttag aaattatcat gaacttagt
43561 gataaagcag tggcagggtt tggagagatt gactttaatt tcaaggtttg gctatgggtg
43621 aaaaatacaaa tggcatocaa tgctacagag aagttcttca tgaaggtaga aattaatgtg
43681 gcaaaactcta ttgttttttt aaaaattcac tccacagtca ccccaacctc cagcaaccac
43741 caccctgata agtcagcagc gatcaatctc gaggcaagaa ccttaccagc gaaaagagtt
43801 aaaaatttact gaagctcag atlatgatta gtattttttt tagcaatcaa gtatttttaa
43861 attaaggcat atacattttt aggcataata gctattatag acttatagat aattaaagt
43921 actattttat tgcactagga acaaaaaaac ttgatgtgat gaaatttatt gcgaactatt
43981 cactttttat tggtagtctg gaaccgaatc cacagtcctc ctgaagtgtc tgcacctatg
44041 ataagtaaaag aaagtgtata aaggaatata ttactgttga aattactaag ctctctacat
44101 agaaactatt taattaagct attgcttaac aattaacagt ttgttaacta ttaacaatta
44161 acagttgtta atctattaac aattaacaac caccaccac attcactaga tacacaacca
44221 taacacagag agcaaaaacca accctcttgt acccaattcg aggtcccaag catcaaccac
44281 atggcctttt ctccccgtg caactcttct atacgttggc catgtatcgt attattttga
44341 agcaaaatttta aaacttctta gctttatctc cttaaatatt ttgtgtcga ttctctga
44401 ttaagattctc attttcttaa aatagaatct aaagaagtga acaataattt attttgacca
44461 tcaaatatc agttgttttt caaattttca atagttaact ttctctgtgt gaaaaacagc
44521 tactattttt ttaacaacaa ctttccaaag acctcaatat ttctctgtgt agattttacct
44581 agtaaggact attgatttca gagtccattc tctgaacatg ttctctgtgt gaaattgtct
44641 catccactat ctgccactca atcaagattt gagtccctga ggaattgtctg aaggtacata
44701 taattcagaga agatgcttat tcttattctt acagagccat ggttttccaa cctgcgggaa
44761 caaagccaca atgagtcatt atgtctgtta ttcttttttt cattactata tttgtgtgct
44821 ctaagattttt gtgactgtcc tggagaattt caaagaaaaa ttgtaagtga tggcaacata
44881 ggctttacac tacatgtggc attaagataa atactattta agtgaataa aggccttaat
44941 actgtgtcat cagaatacta aagaattccc cctcagataa atttatttta atttttttaa
45001 tctttaggga gcagcaaggc gttttatctg ttctcttaca gaaacactta Yggttttctt
45061 atatatatg aataatgtag ttcttataaa tttaaaataag cagagtttaa atgcagtta
45121 cagcatcatt aaaaatacat gcaatatgtt ttataaagtg acttcagagg atgcatacaa
45181 atactataaa aagttatgta tgcaccttta aataaatttg aaaaattgtg tcaaccaact
45241 taaactgtct tgaatataga acaatatgga attttaggaa ctctctgttg ctgcattgta
45301 ctaataatc acggctgaa gtataatttc caaaaattat atgcaaaagg aacctaggtta
45361 aaaaagaaat aaaaactctac agtaaaagaa ttataaactat ttttgttga gtaactttcc
45421 taggaagat tctatttgta tcttttgtct tgaggttaaa aattattgtct actgttttta
45481 aataaattatt tggctttatt tcccaaatgt aattgtcact ttgatcaag catatagaga
45541 ggcgttgtcta ttctcctttt tactctctag tgggtgact ttgatcaag tctcaagta
45601 tgagattcag agattaataa actgtctgta acactgtgcc atctgtgaag acttaacac
45661 tatacaaac acaatcacaa actgcattag attgagcct atgtgaagg aggcagatgt
45721 taactctctc atcttactta atttgatat cagacttttg aagtaagtat tcttactcc
45781 aatttatga taagaanaat gaggttagg attgagcct aactctgatt aagattttcc
45841 tgatggattc ccatctttta agagccagga ttgtcttatt attttttttt caggtacac
45901 taaggctctcc ttggaatgag ttgtgtagg catactaat ttctctttat gaagaaggct
45961 tgaaggaggt attaatattt caactgttgc tggaaataat attgttgat ttgaaagaa
46021 attgttctca caaagattRa gaagattttt taattcccaa atttcagaca taattttgta
46081 tctgtgttga gtagaagaaa tacttcccaa atttcagaca tctcagactt aattttgta
46141 aacatgtatt aaagccttca agctttctct gtcttctgtt catttactca tacaagata
46201 cccatgggta tgtgagccat ttaactgtgt gttttgtagt ttgtttacat ctggcaggt
46261 tcaaaaggt aatgcaagtgt ggcaggtgtt attatgtatt gaaataagca ttgtttacca

46321 gtcataaaca gtgtccgctg catgcattta ttccacctct gctcccaaat gacagatgag
46381 ttgtctcttg tgaagaatag gtaagccctt gattacatta ttaactaata aactactctc
46441 cttctttgat ttctctataa tgaaccttta attatgtgac taaattgtac agaatctgaa
46501 ggtcagaaaa cccaaaataa cacaccatca tacatttctc ttgtgtccct aaaaacattt
46561 ggtaaaaatt aaagtgtggt gcaacttaaa aaataatact gtgagatata ttaatttttt
46621 tatctacaaa atcttaatat tacaattggg gatctctcag aggttaccga ttcttccca
46681 ttgtcttagt tctatgaaa tataggttaa gatctacata aagatacagt ggtactcaag
46741 taataaagac atatagtgtc taatgtacat cacaaatac attataatct aagatataca
46801 ttaatgtaca tccatcacata caactagtatc attatataa tacataataa aatatattgc
46861 ttcagagccc gtgatgagg ttactcagttc tgaactctat gaaacagttaa ggtcgatgc
46921 aactctatcc aaacttttta aacattctaa tttttcaaat taaataataa aaactggata
46981 tttattttaa tctgcttaga aatgttggtt gattgcgagt ctctttctaa agcatattt
47041 taagttttcca ttgggaaaa caattagcaa tttaataaat aaatgcattt ttgaaataga
47101 ctgaaggcta atcaatatat tagaagtact gtataaaaac aatagaatat acaggtaata
47161 gaggaataat ttactttaaa ttttataatg tctgttagtg ggaattcagt agtttttttt
47221 cagcactgaa caatagtgat ttgtatggtt atgttcataa gaatgccatt attctYagta
47281 atatttaatg taaaatgaga gatgtcaatt gagctcttta ttgtataatg catgataaat
47341 tatgtgatct ctaaaatatg aagtgtgaaag gtattttctc tagttgtctt aatgatctt
47401 aaaaaagcac aaaaagttaa aatgaaattt taatgaggtt tcttataaaa aatcttctat
47461 ttgtcttttt ggataaatac atgcaaaatt taaactctga ttgtcttttg gtaactattt
47521 tttaaagtgc caaggaccata tttcttttct atagttagca tgcatttttt catgtaactt
47581 tttataatga aagacaatac acattcagaa aagacaaaa agcataattt tatatacaac
47641 tcaattggact atcaaaaagt gaaaatgcta tgtaaatRtt acgtaggcca aacatattat
47701 tgtactattct atgcccYttac tgttgactct taacctcctc taacctacaa atcaatcatg
47761 ccatgaattc tattgccata gattagtttt gcttattttg aatcatatatac agaaagaaac
47821 atactatatgc aacttttaaa tatctggctc ctgggtttaa catctgctt atgaaaaac
47881 cccatgttgt gtctacatag gtataactga tttattttta tataatgaaa tgcctacag
47941 taatgaaaat aagtaaaagt ataaaaaata caattaaaaa tataattttta aaatatacga
48001 gtattttaaa atccattcta taattggaca tatgaattat actttgggtc aattatgaat
48061 aagcttccaa aatatctcac gtacatacat gtcttttctg agtgcgaaaa ctgcctgatt
48121 ttgcgtctgg tacatcattc ttcagatggg aattgccaac tctataaaaaa tgtatatct
48181 taatttttag agaaaatgca aactaaattt aatggaaatt atccaaattt attattctca
48241 cagcagtgta ttaaaaattcc atttgttcca cattcttgaa aacacttggt attaatcttc
48301 ttgtttttta gatgtttatt gttaccctca tttttgcca tctagtgtgg ttgcataaga
48361 tctcacattt tggttctaat tggcattgtc caatgtctaa taagatttagc aaaaattctg
48421 tagatttgct aggcatttaa atactttttt ctcttttttt cctcattgc ttgtagttct
48481 actatgtatt ctggatacta atatactgaa aaatagggtc taccattctg ttgttttttt
48541 ctattataac atttttaaat gaacaaagt cttaatgtat tctgacatca gtttctcttc
48601 atgggttaaga aaactcgtga actccttaaa atcgtgaaaa tatctacgta tgttatcttc
48661 ctataacatt actgttttgc ctctcacatt tatgtctaca gttctctcg aatccacttc
48721 tgcatacgtt ttgaggtagt gatcaatctc tctttaaaaa tttctttctt ttaatttttt
48781 tatgggtatg tgaattgttt tgatacatgc atgcagtggt aactaagcac atcatggatg
48841 ggggtatcca tccctcaag gtgttatctc ttgagttaca aacataccga gatacatctt
48901 taagtattca taaaatgtac agttattatt gactatagtc accctgtgtt tctcacaat
48961 aataggtctt agtcattctt tctgtttgtt tgtaccctgt aacctctccc accctccctg
49021 aagcccccca ctacacttct cagcctctag taacctctgt tctactctct ttgtcataga
49081 actcaacttt ttgtattttt agatttttct ttttaaaatt ttctccaagt ttgtatcca
49141 atttatacag caccatgtat ttaaaaaagt ttttttctc cccactgtct tcatggcaca
49201 acattgttaa taatccactc tccatcatgt ctgaactctg tcttggtatc tctgtctgt
49261 tccagtgatc tgtttgaaga acctgccaat aagacattct ctattttctt ataactatt
49321 aagacttaat atccagtaaa aaaaaaaccc tccaacttgg tttttcttga ggagtatctt
49381 ggtgatttcc attttgttac atttccacat aaaaacttga actactctgt aattgtgca
49441 cacacaaaaa catgtgtttg aattgtgtat aatctatata ttaatttagg agtatgtaca
49501 tcttttcaat atgtattttc tactataaac cttaaaaaat ttctcaaat ttattataat
49561 ttcattgttaa ggcattaaat atattttatt agttttttac agttaataaa tatagtttga
49621 tactaatgtc aatgtcaatc aaaaaattca ctctctgttg agtttaataa atgtttttaa
49681 tcttttttat atatagactt ttattcaaca gactgtctaa actaatctca tagatttttc
49741 aaaaattctca catttgcact catcacacta taataaagg cagttttatt tctctcttc
49801 caatccactc acctgttaaa tatttttctt gccttatcac actcaataga agttcaatc
49861 atttttaatg aaagggtcta tacagaacat actgtgcaca tctcacaaca tccaaacgct
49921 ctgacgaatt cctataatgt atgatactg ctgtatgatt ttacagatata ctctttgcag
49981 aggttagacat tgcctgctgg gctaagaatt ttaactctgt tgaatatata ctttatgac
50041 aatgcttttt ctgtatttgg tagaanaaac atatgttact taaatgtgata aatcacatg
50101 aatgactttt aatatattaag caattcttgc attctcgtaa taactcgatg tgagatatag

50161 tttattatttt tttctatatt tttatattgt agaactattt ttaaactatt ttttaaggagt
50221 ttgtgattgg caattcatggg taagatcgac tttatttttc ttctcttgaa gtctcttgct
50281 agatttttaatt atcagggttta tgctggccctc acaaaacaag ctgggaaagca ttctctgttt
50341 ttctgtctctt tgaaggtaact tgttttaatac ttgttccttaa atgttttagaa
50401 gaaattcacta ggaagagacat cgaggccctgc aattttctgtg gtgaatatgt ttacaattat
50461 gcattgtaact taacagatgt gggcagttca ggttttctgt ttctcatctgt ttttgtaag
50521 tggcgatttg ttggaaattt atttcatatta aattttgtaaa attagtggca taattcgaaa
50581 taactattact actctaagt gtataggatc atcgttaagat gctcttttgc taacttgata
50641 ttgtttattc atgtcttctta tttttttctt tcccatgatca atcctaacta gggtttttgt
50701 aacttaaacg ttcttttcaa aaaccaactt gtgttttttt tccctaatgt ttgttaattt
50761 tcatatgtat tttatcatgt aggaataata cctctgttag aaagaagaat atacagaagt
50821 caaaatgaaa aataattaca atagtctgaa ttcccaaat ctgggataaaa cacacttct
50881 ccaaattttg tgtatattct ttcagattta taacacaaat gtatttatga agtatgtttt
50941 ctaaaacacac acagatgaaa tatagaatta tactgaatgc tatttgatca atatggccat
51001 tgttttctcta tttttatcat ttcttactac ttccctgctt agattattttt aaaaactatt
51061 taattattgca tgaccttctt caaagattct acaaaatata tttataacta ataagggagt
51121 tgttttttaaa tagaacttaa aatgagcata tctaacataa tttataagtt ctgcgaattc
51181 ataaaaataat ctaggctat ttgacttctg ctgtgtgtgt aaaaaattt ttttagaatt
51241 tattattttga attagaattc aaagtctaat aatacgttga attaatcaat gttttatagt
51301 caaatactat ttattacctt tgaatcatt tttattgaga aaagtatttag ttgccataaa
51361 atgcacccaa ataaagtga cgaattgatg agttctgata aatgtaaaa cctgttttaac
51421 cccacaaaga ggaatcagaa tgtatccatc acccaacagt tccctttatgc ttctttgtag
51481 caaatgctca tcaacccctg accctggaaa taatcagctt tctgtcactg tagagtattt
51541 ttactattctt agaattttat ataaatgaaa tcatcttgtg ttactcttta ttatggcat
51601 ttttcatctt acaaaaattt ttttaattgt ttttatgttg tttagtaact catcagttta
51661 ttgtcttttt ttgataattt cccattgtat agataactg ttgttttttt ttcttttaac
51721 ctgtctattt ttgtcaattt attcatctt tttcaaaaat ttctcttaatt ttgtgcttta
51781 atttctttta tttttccccc taatgtctta acttctatcc ttaactacta tatctctgc
51841 ctttctcttt ctgatatcca tgggctcaat attggtgact ttgtcttcat ttgtgatatt
51901 gataaattgg gtcttttctt tccctttttt ccccataga tagcaaaact gaggtttatc
51961 aatcttagca aacttttgaa agaaccact tttagtttgt tgattttctc gaattgttct
52021 ctgttttcaa ttttattctt tgtgctctaa tttttaaatt ttcttctctt ctgactttt
52081 taggcttcaa tttcaattc tctaaatacc taggatgaaa acttgcatta tttatttaga
52141 tctttgttgt ttttctaata tatgcattha atgtacaaa ttttctcga acaactgctt
52201 tgctctatcc tgcgtattt gatgttatat ttctatttcc atacagattt aaacattcta
52261 gataaattca catgaaactt ctatttttaa ctgaaattt ttacagatgt taggaaact
52321 tctagtattt ttctgttat taatttatag tttaattct ttatgacctg agagcataca
52381 ttgtatgatt tctattttta taaatttgca agagtgtgt ttatgacctg taatcacatg
52441 tgaattgtcc atgtgagctt aagatgagt tgctgtctgt tgttgggtga aatgtctca
52501 aaatgttaat taaactagt tgaataatag tgatgtcag gtctctata tcttactgc
52561 ttctctgctt ccttgataca tcaattattc caactataat aatggaactc tctgttttta
52621 acttgccact ctatcagat ttgcctatc taacgactct gtgtgttagtt ttctacacag
52681 taggattat ttaccattct tggaaaattg atcactttgt ctttaggaaa tgtttttgtg
52741 taaccocaaat aatcttctct gtcttccagg ttcttttgc tgaatttag tagtctct
52801 cggcttttat ttttttatag ttttaacgtg tgatatatct tctctatcc atgtactttt
52861 aaatgtacgtt agtctatatt taatgtgagt ttatgttaga caacatcatc ttgacctatc
52921 tttctatata cctgcacaat ctcttaattt ggtatattha gatgtctcac ttttcaagt
52981 attattgata tatttgaatt aatatgata atgtttttaa ctgttttcta ttgtgtgag
53041 ttgtttttta ttttttgccc catttttaagt tcttattctg atttttaagt ttgtcaagtt
53101 tatgatctca ttttatctgc tctttactg tcttattatc taatcaaaaa ttgtcaagtt
53161 ctgccttaaa ctaaaccaaa gtctatttcc aaattatatt aatcactatc tacttattat
53221 atagtgcagg tcccttaaaa cagagtattc ctactctctc ctactacgtac tgcacaaact
53281 tcatttgtta tttaggtgaa tgaattatta atttgcaata aaaaattaat tcattttaatt
53341 tatcatgtga ctataagcac ccaatgcag tatattattg taattgtgtg taatttaact
53401 aatgattttta ttaactaaga ataagaaaaa taaatgatct tacttctttg atttcttctt
53461 taatgatctt ccttttctaa tgtagatcca gattctgag gattctgtgag ctatataact
53521 ctgaaataact tcttcaaaac ttctttatag ggaaggaatt cctctcgatg atctctgagt
53581 ttttttttgt cctgagagtc tttatttctc ctctcaattt gaaggaatc ttctctgagt
53641 atagagttgt agttttattt ttacttttct caatgtttta catattttac tctctcttct
53701 gctgtgtgtg ttgttttctg atgaaaagtc ctcttcccaa aatttttgtt ttgtctttgt
53761 agtaataatag ctactttctg atgcccctg ctcttcccaa aatttttgtt ttgtctttgt
53821 ttactgtgaa ttgtcatctg atatgactca gaattgtttt ttttttgtt tttaactctc
53881 atgtttatct tctgagtttc ctggtactac agttcagttg ctgtcatfca ttatgaaaag
53941 ttattggcca ttattacttc aagtatttct ttgtactatt atcttttctc tctggtattc

54001 cacttacgca ttgtttacaa cgtttataat tgcccacaat tcttgatact atcttatgct
54061 tttctttttt ctttttttat ttctttttt ttctttttt acagcgtttt
54121 tttctttttt ctattacagc ttgagaaatt ttgtatcttt ttctttttt atatatatat
54181 tttttattat ctttaagttc taggttacat gtgcacaatc ttctgtatct ttgttggtgt
54241 tattgaaatc gtgtgtgggc ccatacaagg catctttcac tctgtttcca gattttttaa
54301 ttttagcat ttctttttga ttcttttgca gagttttcat tcttcogtta catttaccat
54361 ctgtttttgc atgtttttgag cttttttcat tagacccctt agcataatYaa tctagtgtgt
54421 ttttaagcct ttgtctgatt tcaacatctg tggcataatt gagtctgtgt ctgataaatt
54481 tttgtctctc gcagagtggt ggggtttttt ttttttact ttttgcattt caattgtaata
54541 ttttttgtaa accaaaaatgc actatattct atgacaatag aaactaagac aatgtRgtt
54601 tttagtatgaa gattttacatt actctggcta agaaatgggt tacagtttag gtttgctata
54661 ggtactatag gtaccagatg cttccgggtc atctaattgca cttatttcta ttccctctt
54721 tgacttaaat ttctttcaga ggcgttcttt gttttttaag tctttcaact gttatccagt
54781 attattgcac tggactcctg ttgtgtgggt gtctgatgtg taagagagac aatgtttctg
54841 aatattccaa ctcaatttaa gtgtttcagt ggggtgttgt ctccagaactg tgaccttcaac
54901 aagcatactc ctggtggtat agcttttttc cctcctgcca gtaactgtct ttctgtctgt
54961 ctagtctttc aatctatttc ttgtacgtct tgaactcctg tegttttttt tcttagagta
55021 agacaggaaa ggtacggagg ctggaatggg agaagtactg cccccaggtt gccagagggt
55081 ctggcagaat cttttttcca ggagaaatag cctttgttat gaagaaacac ctgagcatac
55141 ttacacagca ttccctttcc cacttctgca cagagccaga agggagctct ttcttaactt
55201 tcatagaaatc catggatggg ttcttggagg taagccccc agaaattgtg agccctctaa
55261 gactgtgtgt aggaactctc cactctcatg ctagtctaca cctcagtttc agactctcaac
55321 caaaattatc atagaagttt tctgtcagt ttctgtgtgc agtggctttt gttccaggtt
55381 gatggatctc agctctgact cttgttaggt tcccgctcct ctagtattca gactgtgtgt
55441 gtgtcatgtt tactagcttg ttgtctgata accaatacca tagactgggt gacttaaacca
55501 acagacattt attacttata gtctttgagg ttgaaaagtc cgagaacaag gacttaacca
55561 attcaactct tggtttaggt cctattttgt gtttgagat ggcattctct ctgctgtgtc
55621 tgcacctggt gaagaaaaag aagcttgagc tctctctgta ttcttataag ggcactaatt
55681 tctctatgaa ggcctccact catgacctta tcaaaatttg aatcctctcc aaagacctca
55741 ttccaaaata cagtcaact gtgggttagg gcttcaacat agaattttga gagggtgcAA
55801 ttatttctat agcaccatga aagcacagtt ctctgatgag tctaagaaaa gtgattgatt
55861 tctagtttgt ttgtcttttt tctgtgtgtg cagtgtagag cagtgtttca ccttgatgatt
55921 ggtactgtgt gtgtgtgtat aaattttcta atatatctta acagaaataat atgtatattc
55981 tgtagaatat atattagaat aatgtatatt ctgtagaata tatattagaa taatgtatat
56041 tctatagagg ataaatatat atttcccttt aagaacagtt ttgtgtgcta ttttattatt
56101 ttttattgta cgtaggacac tacataagaa aaaaatgaat agacaattt agccctagaa
56161 ggcattcttt ctgcaaaagt taatttcaat cacttttaca ggcaaccaga agcactgaac
56221 ctctctgaca tctcaactat aattccccc agattggaaa gatgggaatt ttacctttaa
56281 tctcctgctg gggctgtccc atctctggct ttccctttat ccttaaaaaag gatcctctta
56341 aattcttaca aaaagcctat ggaagcctgt aaaaatttct cttctttgag ggccttagaa
56401 ctaaaatttt gtccctaacc ccatagaagc ttgtcataaa accatgacca aaaaacacaa
56461 aacacaaacc aacgaaacta cccagctatt gtttctctc ttccagaaat ctttagttat
56521 cccataaagg aaagcctcaa atgctgggtt cactctttg ggtttttct tcttagatct
56581 tggacattta atattttatt atatttttat ctcttcaact ttttttttat ttcaaaaaga
56641 ggggttcagaa ttccagctct agcagtacca taatgtgaat tttttagtt atgttccatc
56701 tcaataaaaa tttagtcttc cacaaaaatg tacatatcat acctaatatt aatgtaaagc
56761 ttttagcttt gtccacatat ctctcataac acaattttat gctgtgtttc aacaattagt
56821 acagattaca gccaaagttg catctttctc gtStttttt tcttctgctt atttgatctg
56881 tcttgggaat tcaaaccttt ttatgcaaaa ggtcataaac agtataattt ataacttgta
56941 tctccataga ttctaataa atgatttgca caagggtct ctccaatttt catctaataa
57001 ttgtgtctct tcaaaataat attttaataa ttgtcagtat ttttgggaag ttgttagagt
57061 gtttaaaaaa aatttccatt cctttaatt ttcaaatga tgcaaatgt acgtgcagct
57121 caaaacttaa catttcaatt tgattagtgt attctcatt ctatttcttt atataataa
57181 atgaatttta cttcataatt caagactgaa tcaactttgt tgaattacagt ttgttagctc
57241 ttgttcaaat atgttttaaaa ttactctca tctgggttta ttgtagcaaa ttttccactt
57301 tctagtagtt cttattttctg ttgtcttta ttataactt ttatataact gataaccttt
57361 tgggaggcac atttagtaaa gatttatacc tgacatcata aaattaaaaa gtgatttcta
57421 ttgacagca ttgttgtatg atttatttag catctgaat tcaagtgact atttcaaaa
57481 gaattgtact tgaataatag tcatgtgtag gacacatgta ggtcacaaga attctcaca
57541 caagggaagt tattaatgac aaggggatt ttcatgttcc tcatgttctt ttgtgaactc
57601 taactgtgtct gctctttatt tggatggagc ttgactgatt tctatataat tgcagactct
57661 gctgtgcac tatgtgaac gggctccatg ttctgtatt ataacagtgta gcttttagag
57721 ctctctacaa attgccatat gggcatctcc ctttatact cttgcttttt atactgtagl
57781 tgctcaattat atatttgaaa aagaatttag tgcattatg cctctctata aactttagaa

57841 tctactttgga aatactcaaa atcctgtgag aaactttaat tcatataactc cataaatttt
57901 ctctgggttaaa atacattcct aaattgtcta tgaacacctc attgagtttg gaaatacaca
57961 agctctaaagg aaaagaaaaa tacaatgaag gcttttttgt tttttatcat taagcatgat
58021 aaagtctcatt ttactctlag atattttatg tacttaatga tattaacatg attctcgtct
58081 tactaggagg ttactatttta tatgcaagag tcttattgat tattcaatgt ttatctcata
58141 tttttgactc caataatttt gggaaagat ataaagttaat agaaaagtct ttgttctata
58201 aaagtctcag ggtgagctgt agtccagctt caacaataac ctaagtgcga ttctctaaaa
58261 atgtgtaaaa ggttttaaac ataaattatg aggaaaaatg caaaaagctt catataaaaa
58321 attaaattct ctctagggtta agttgtttgc ttctatgttc ttgttgaggt atgccttttg
58381 atggtctagc taaattatgg cttttggagt cagaaaaagc tgaattaaaa agctgctctt
58441 gccactttct agctgtgtga ctttaggcac ataacctcta taattttcat ttctcctcgt
58501 tgtaaaagtgt gtacaaaaat aactacttca cagagttgat gcaaaatatta aagctagcta
58561 atacattttct gctatgtctg atgctgagcc cctaactttc atgttgaaaa ccttaaaatt
58621 ggtaacatag aacgcaatca ctagtgttta tggccaat attgtgtctc caaaaaact
58681 catatattga aatcttaacc ctcaacaaga tggatttagg tggggccttt tgggagttga
58741 tgtaaaagtgt gtacaaaaat aactacttca cagagttgat ttaaaaaaga gacccaagg
58801 agctcatctca ccgttccacg atgtgagact acagctagaa agtggcattc tatgaaacat
58861 gaagttaggc ttccaccagc accgaatctg ctggtgcctt attttggac ttctcctcct
58921 ccgaagactgt gaaaaataaa tttttgtgtt ttataagata ctgagtttat aggtttgaa
58981 gtgagacctt ctataattatt ttctctctct gaaaagtgtg gagataattt gagggaacata
59041 aaagaataagg atttatacac aaaccagagg agtactttaa gagtgaacaa aagatccaaa
59101 gcacaaaatt agcttggcat gcatctcaaa tgcataattc agagaccttc ccaaaaatt
59161 agtacacagg tccaagattc gtttctaaag aaacacctca agtaatgctg acattatacta
59221 aagttctgaa gttttaaagg aagacataaa tgcctcgtta ttctttgaa tttttttgaa
59281 aaaagataaaa gagatactta aatccatgca ttcttttgtg aattgttatg gcaacaaatt
59341 ttcatagcaaa attgaggaaa gtttctcagg caaaggataa catttgaac tcataagcat
59401 gcaactgaact ttctatttat aaagttaatt agcatcataa gcatcatcca caaactctt
59461 gaaaatttcc atcaaatatt aaaaatccaaa gcagatactt ggttatgtat gaaaaaatt
59521 caacagagtg agcaaaaatt gcaaaattat tgatcagtta ataaatataa taaatagtaa
59581 ctgcatattt ttccaagtga cactggcatt agaaaattat taaagatata cagagtgcta
59641 ctaagtaattg cttttgctgt ctgtatggct atacaactct cctatgtgtg ttctccattat
59701 tttattattta taaaattaat acatgcccat taataaactc agatttgact ggaattgct
59761 gtaagtccca tatcccaaac ctcaacaatt tcttaccctt cctaagaga laattgctaaa
59821 aagttttgaa tatgacaatg atatttttat tattaataa aactgtatct tatattttat
59881 cttaacgcttt tcaaaattla aatagctcat aaattgatca agtgaaaagt gaaagctgt
59941 catttgcaga tgtcttatct catttacctg ttgctgtct ctgccactgt gcatcttttc
60001 tccagctccc ttaagacccc aaatcatgt aactcacatt aattttgaaa caaagtgtg
60061 atctttttgga gggtaattta attaatcctc cagctgttca ctctgcagaa aattataatt
60121 agggattgtg ttagtctgcc agtggcactt aggaaataga atcaaaagta taagaagatc
60181 taagatcctc aaccaaagct gcacattact ctaattttgga aagcttgtaa agacataaagc
60241 atacagctgt ggtgcggtg ttcaagcctg taatcctcaac acccttgagag gccgagggcg
60301 gcagcatcatt tgaggtcagg agtttgagac cagcctggcc aacatgttaa aatccatct
60361 ctagtataaa tgcagaaaaa aaattagcca gccatgtgt ctggggcccg taatccagcg
60421 tacttgggag gctgagcag gagaattgct tgagcccggt agtggggagt tgcggtgagc
60481 tgagattgtg ccactgcact ccagcctggg tgacagagt agactcgtc taaaaaaaac
60541 aaaaacaaaa caaaaagacg taagcttaca catacacaca cccaaaagaa aagagagaac
60601 aaaaatcaat ctgaggtcat gagcgtgag agtttttaat tgcagttcaa gttcgggaaa
60661 cttgccccta tatcagccat cctaanaagaa attgaaataa tcyatttttt aggtgaatca
60721 tgcggattgc catagaaatt gagacttag tgcctagag gttgggtggg aataagattt
60781 ggtttagtga atatagaaaa cagctaacct tcttaccaca accctagtaa aaaaatttga
60841 ccagtggaac agaattggaac ctctcaggg gtctgggtat cagagtgcaa attccatg
60901 aattaaacaa tgttctccta tttatgtct gggaaaacac agcttggtaa ttgtctctg
60961 aaaaacaaag cagcaacaat agcaaaaaa caggggagca gtttctcgc ctlatatgt
61021 tgagatgcgc taggttaagt cctctgccat ggggtgatac ttgcaatttt gacacattga
61081 acatgcatct ctctgagagg cctctgaatt gagacatccg ttgaactttt gttttgtttg
61141 laagctcagt ctttctcaaa catacacatt caacatata tttattgaa accattttga
61201 gctgaacaat gttctaggtt ttacggatg aacacataa acctccctg tttatagag
61261 ttgtttttct agggagataa gataaaaaga caataatga caactcctc gaactcctc
61321 ttaaaaataa gagaaatata gagaaaaag cagaatattt atggggaggt ctaggtaaac
61381 aggtactctta gagactgtga tcaaaaagg cctgtctgg gggtaattat ttgctcaag
61441 cttaaaaaag caagagagg agggcatgca aagatctgg gaaagactt ctacagacaga
61501 atgagactgct ggtgcgaatc cctgagagaa ctgtgtcaag gaggtccagt
61561 ggtgtagag catatggaa gtggttcta aagactgtgt ttgaataagg agtttagatt
61621 ttgttctaaq tggcaagaa agtgttgggg atgcatatg ttaatttacc

61681 ttactgtgtg ctccagaggg aagacattgg ggtgatggc aaagaacaaa ataataataa
 61741 agaccaggaag gaggctgtca ggaagattct ggtgaggtga tgccttgttg atactgagttg
 61801 tcatattgaa ataaagagat gccccgattt tggatataat ttggagatgc Yatcacagct
 61861 gctcgtgtgt tctgtgagct tgaacattta tgttatgggg tctggtgga gtgggggcag
 61921 aagtgatggg attgattgac aaggagaaac aaattaattt aactataaaa cacccaattc
 61981 tttaaaattc tactagaaaa tgttttggtta aatgaYagta agggaaattt tctgaaattg
 62041 aaagaaaaaac aggcagatga tcagataccg tgggtattgg tgtttctaatt gttattatct
 62101 tgccttctgt cagctctacat gaggttgatc ttatttgggt acccagatgc aggcagaggt
 62161 ctatattgac accctgcaaat gtatgtgcat tgcctcttat tatgaagagaa agaggtggag
 62221 gagagagaaa aagtgaccat gacaaggaag gtgagaataa aaaaattgatt gtaaatattt
 62281 gagaaacaat tctgcttcat gctgacttct ccactgtgag tcttaacagct gtgctgtgtg
 62341 gaagaaaaaa aagttgcat aaatgttggg gctgcagta tgtgggtttt acaggttaagc
 62401 tacctattat gtgatgcat cctgatttta tgaagaaaa atagctcctg gccctaccat
 62461 Rtaatgggtt caatgggtgc aaacactgga gggattttt gggattttt tcttcttctt tctgacctc
 62521 taatttctct gtctgcaatt tgactgtgct agcttagcat caattcccaa gatttctcta
 62581 gctttcaaat tctaaagtcc gtaagtttaa ttacaggtct ttccaaatta tatgtcttc
 62641 caatttctct tcacaaattt aatgtgtgta tctggcattg tgcctgctgag gtttaacaac
 62701 ctgttagctg ctgttagctc caacttgaat gttgcgtgtg acttttcttt atgttaattg
 62761 tgaagatgag aaagtgaag aaccaaaaga catcatagct taattctatc atcaattgat
 62821 taagcaactt ctttgttgac tgaattgatt gttttcaac tcttggagaa tttttctga
 62881 atttttttgg tgcatttcat aatgttaagt gctacagaca tggcactatt ttactgttaa
 62941 tctacacttt acagaagcaa tttttgttac aggtatcgtg gtgcaaaact agtttaatgg
 63001 ggtgtgtaaa tttaaaactct cttaagaaaa aagaaagttt gaagcgacag taatttctct
 63061 ggtgtgagag acatcatgac ataactgtta atgtgtttt tcttatgaag gtgaccact
 63121 tcatagttaa atgcagatca cacatttgcta atagacatta taggtgacaa gctgaaatgg
 63181 atgttctcaa gatacattga tgtgcttctt tcccttttct ttttgggttt tctcagaaa
 63241 gcaaatgcag acagtgttgt gtactataga ctccagcctt ctatcgaagc cagatttctg
 63301 cgtcttctcc ttttggaaat gaaccccaag ggcagaattg gaatgcgaat gaaggtgttc
 63361 ggtgtgcat acagtaagtgt tttgtttatc caatacactg acatgatatt caaagagat
 63421 gttttaaaag ccaactaca aactgaaatg gactttttag ctacataaag aggtataaaa
 63481 aataggaaata atttttggg aaagcttttt tgtgcatgcc tgcatacgc aatattgact
 63541 ttcattgtca actttaacat tttaattcag agatggaagc atctgatga tttgatagat
 63601 catatttact gatacatggg aatgtatttc ttcaaataga atattattga ctatgttga
 63661 actttcaaat attagaagtt tcttctatga tttattttt atgtatttct atttaggtat
 63721 cctgagttcta ataaaaggga cagtgttcca tttagtttaa ccgtcatgtt atgaaccaa
 63781 aaaaattttt ttctttagcc taaaacaat atcatgcaat tcaactttaa atgtgctatg
 63841 ctgtcagtat aaattaaatg aaaaagagaa gacttctgcc tgaatataac atgtgttaa
 63901 aatactttca cataaaaaag atagaaacca cagatttcc ttagtctctt cttaatgaag
 63961 caatttatta tatattttt ttgtgagaaa gggacctaa agttatgat agtgacctc
 64021 aagcccaatt actcgtttag atacactttt attatagaac agtgggttag ttaatatgat
 64081 ttacaattag cagactaaca gtgtgaggtt tgaagagatt cactaaattg ctgagacct
 64141 cacatatgaa ataatctgga agagaaccaca ggaactgtca atccagaca tctgatttct
 64201 ttttctctca gtaaacattt atttttagct actaaagctt tttcataca taccgtgtca
 64261 ctttgtgat tgaagcaagt taagttctga ttacttctct ttacataaaa gagagatcag
 64321 tgataaagat atcaagtgc ttgttgaagt tgtctaaact ctatccgaca gagagatcag
 64381 attgcatggt ttgctgggtt actctcctgt atttttgat gtttctagtg tttactctca
 64441 ccatcaaaaa tatttgacag acctgattcc tccaggccct acagaaat atactaaaa
 64501 gttttaaat atatttaata gcaataatag ccaataacat aatgaataa ttaatagcat
 64561 tcttttctat aactgtagaa atagcaccgt ttctcttagt cttattatat gcaacttcc
 64621 aagcagttta cgttctctca aaatagcccc gataaaattt actgggttaac tctccattt
 64681 acctcttttg aaaaagagaa agctaaagct tagagaggtt gacttgtcca agccacagac
 64741 aaaggaaggt gcagagctgg gtttgacgcc aagttttgcca actccagaaa agcagctta
 64801 tattgacatt tctctagtt gttgaataac agagatgagt cagtgagcca ctacctctc
 64861 actatctgtc gcctttaatt gcaagcttct gttgcttcaa caatcgactt tagctacact
 64921 atgttatgtt ctcacgtcac aatttagtata cctgaataaa atcacgattt aaaaaaact
 64981 tatccccaat tatgatcctg caaactagaa tctggacagt ttggagattt gttcttggat
 65041 cgtgagagct agcaaaagct atgccacatg atggacaact agtaaaaaa actttcaagt
 65101 gcttctgttt tacagttata tcttccactt attcagaaca tccactctgc aaaaactgtg
 65161 tctatcacag tataaaaaa gctaaacagtt atttgcgtat tatttttgg agacattcta
 65221 ctataaattt aatctcaaaa acccaacttt tattagagag aaaaactgggt cttagaaca
 65281 ttaagcaatt tgttcagtat cacacctta gtatgcatta aacttaggat ataaactcaa
 65341 tatttaacaaa tttaacatta agagcaacag ttttagtggg actgtttatgc ttttgggtg
 65401 gctctaaagc accaggtata atgtccacat ggtgtgtgata gctaaagtat aggttctttt
 65461 gagttattctg ctgctctgtg gctaattgata actcaaacct cccctcacc

65521 tgcagctctc tggaaatgttc tttttgttgc aacttcattt gctatatttg gggtagcat
65581 actgtccatg tatttggcca atattctttt cacattgacc cactattgtga tagtagatag
65641 tggaaagccag caggattttaa aactcaaaact taacacacata tagtgaataa tggtagcagg
65701 agttaatgac aatgatgggt tgtgaactt taaccacatta ttaaggagaga aatgataata
65761 aacttaatagg ataaacattc ttgtagataa tcagaaaaata accaaaagaat gggttgggca
65821 tgaagtacct atgggaatgt atttgatcaa atttggcttt agagactgta aagataaagc
65881 tcatgctcac attttccacc tgttcatagc attggcattg caatataatt ataaaaatgt
65941 gatattatat agccatcatt tattaagaat aatatgtgtc agagactgta aagataaagc
66001 cattttctgat ttgttccctag taatgtaggg aagcagggcac atgaattatgt ccatttcatg
66061 caggatgcag aggaaaaag cagaattatc tactgaataa gacatacagc ttgtctctgg
66121 tggcatggca aagaaatagc taggactact ggctttccct ctgcaactcc cttaagtgc
66181 tagttgctat catcacaagt atcctgttgc aagagtttgt cactgtcacc aaatlaagct
66241 acagaccocaa gatcagattg gattttcccc agacacaaaa gactgttctc ccgaatcccc
66301 tattaaaaagg aaaaagggtg ttggggagtg ggtagggttt ctttactgaa tccagccac
66361 aggcatttca tccatgcccc acaaaagtagg ttcccccga gcttgaggaa ggcctgaagg
66421 attgcattga actggccatc ctccccgtgc tgtgctcct cactgtcacc aaatlaagct
66481 gactcagggt cgcttcgcct gagccattca ctcaagtgta gacacactgc cagactgctt
66541 catctctctt gacatagaag aagtggaact taagagaaat tggtaacttt tgcagaata
66601 cacaacccgt gttagattca ggaattaaaa tcagctgtct cacttttcta agccagtgcc
66661 ctgtataact atgtgaatca tacaagtatt gagcctttaa ccattttcta gctactgcca
66721 aaaaagaaact ggtatgggggt ataggagagt attctaaagt catataatatt ttcttaataa
66781 agcagggcat gtgcaatgtt agaaaaatta tatgaactaa gtataaaaaa ttgttagaag
66841 agtatagggt gtgagggata aagtatttga taaattgttg tttagtataa aaggtttata
66901 cgagtagatt ttgaaacaaa gttgcagata ttttcacatg ggaactgtga aaagtgtgcc
66961 aaaaaggaaa agtgcctgac cccagtcagg cacaggaagg aggattgtgc aatgattat
67021 ttgagttagc tcatcagac tgaaaatagg gctattgggt agaggggtga ttctggaggc
67081 agcaactcat tagaaggctt tcaactctgt ttggcaaggt gatgttagaa ccccaagcta
67141 gaggaacagc aatcagtaaa gggggaggaa gggcaaggcg ttacctgagg tccagtgtaa
67201 tccagagact ttggaaggtag agtggggggg ttacctgagg tccagtgtaa ggcagcagc
67261 tggccaactg gccaacaccc tgcctctact taaatacaaa aatatcagcc ggtgtggcag
67321 cgacagcctg taactctagc tacttgggag cgtgagacag gagaactcat tgaacccagg
67381 aagtggaagt tgcagtgaa cgaactatc ccaactgagg tccagctggg gacagcagc
67441 agactctgtc tcaaaagtaa agggggagggt aagcagattc aaaaattctt taggatatt
67501 aatcaagata tcttggtcat tgtatgtgag ggaacactga gtaatacaat ttgcttttt
67561 tctttctccc gttgatcctt ttttttctc tcaaaattga acaactgtct ggaaggggct
67621 gtcatttact aagatgggaa atgagacaa aatatagatt tggaaagaaa caagagataa
67681 ttaactctgt ttttgacaca ttgagttcaa gggcctttga tatatggaag attggaactc
67741 caagccctct gagttgaaga cgtagaatta aaacctatat aatatcatt attgttagta
67801 aatcataaag tattctactt attgtactac agttaataac aatgcctgta agtgctatgt
67861 ttgatcgact actcatgtct tgaaaaatgg gaatgcattt ccgtcatatt aaaagcagc
67921 cctttgtact attttttagg tggaaataat attttttagc caggctcccc ttgtgcttaa
67981 tcatgttttg tgaagtcac agatgcaagc ctatcctgtg attattacag gaaaatggta
68041 atttgtaaaa ccacacataa attgcccgtt accccaacaa gttgagggcag taactgttca
68101 tgaaggaaaa tcaagtgaa ttatcaaaag tatcaaaagag catgttctac ttttatgta
68161 gtaacttgaa agttgttttc tgagtaatga gagaagtaga ggcataaatt ttatgggata
68221 aagagaacct ataaatttcc aatatcttgg ccatagSagc cctatctctg ttgcagatc
68281 tggagaagaa atgtatagaa gtaaat tact ggtgggagaa agaaagaaaa agaaagaaa
68341 atgttttagt ctacagaaac aatactacat gcttgaaga gactgaagaa gactgaagaa
68401 aaggaaaaat aatgggtgaa agtgaatata tctgcaatgt ccttaggaag cagcaatata
68461 accataggag ataatgttct ttaattgttg atgaattgtc gggcagttg aggtgaagta
68521 aatttctaatt ttctttttct ctagtactgt tataaacatc cctattttgc agcctatgat
68581 catctcttcc tcatcccaac cagaataaga acatccaaact gccaagcact aactcaatga
68641 tttgtttctt tggctagcca tgatttttat atttttttag ccttaggttt tctgtcatga
68701 ccttagggca atcaccacgt acccaccagg ctctatttct ctctatttgg atactcttat
68761 ctcaattctc ttttctcagc atagaatatc ctgctctga caacttctct caatcccaac
68821 attcaaatct gggaatgttt ccacccactt gtgaaacagc ttgttttat ttttctctc
68881 caagcccccag ttatactggg ttgcaaccag acattttttt ttgtttat taatgcttag
68941 taaagactaa taacaacaat gaagaatgaa tgaattgggg ttgattttaa tggtagcct
69001 aatgctttct ccatcattct agtgttcaac ttgtttaaag tcaagaaata aggttagcct
69061 accaggagaa ctgagggaga agatggaca ttgtatggca atgtacagat atgtataacc
69121 atttgtttta attgcttcaa tgcagacagt tgaagagaaa atattggatc atatttata
69181 aattaaaact caatcatttt aaaaacatat aactgcaca taatagatc atattcttta
69241 tattttaaaa aaattccaat ttttttcaat aataaacat aagattggaa ttaataacca
69301 cagcagattt aagtttagaa aacataaaa gaggaacaatt taataaggatc

69361 cagacatttta cctgggtgag gaaaacaaaa cattgaaaaa cagctagata atagctctcg
69421 tctattccagg atgcctaact ctcataccac ctgtctgggt aggggggaaga atgaaagca
69481 ataaatttgcg tagattttatt aaaaatgatg ttataattga gttaacatacc tatattttga
69541 gcaactccga catgcctaact gctaaaagct ggagtaagggt gaattagata gtctctacac
69601 tccagattatc tatcagctaa tatagtagct gagaaatact gttttatgtc aaagtttga
69661 aagaagaatg actctgattg gcctaaaatc aaagagtata aattctctaa tctcttgca
69721 aatttataaat tttaagtttg atgacaagtg gagtgtatta ggggttctcta gaagaacaga
69781 actaataat atctgtgtgt gtgtgttctg tatatatatg cacacacaca tatatagaaa
69841 ttatatataa caaagggata tatatcta atagatcatt tgtataatta aaatatatat
69901 atttataaat atataacta gaaattatga aatctggaat atataaag gaattttat
69961 taagtattat taagtatttt actgagttatt aagttattat gtttaagtagt tattaaggtc
70021 tctccaaata agattatgac acaaaagccac aaagctggag agtttगतat accctgagg
70081 taggacagta aaggtattatt gctggcattg ccagctgaaa gcaaatgttt tctggtgagc
70141 ctattggaca ggaatggaga aaaaggcatt tgccaagtca atggctgcac accaggtacc
70201 agggagattgt ttaattggag caggcaatga aaccacatct agtacaacag ctgcaattgc
70261 aatcaccaet tgattaagct tacaataatc cgtgtcatt ttccaagatc catctgttct
70321 ctgcagaggc caaatgggag agttgaaatg ggtgtgtgt ggaatcacca cccctgcatc
70381 tttcaagtt ttgattgttg cactaatctc tgcagccct ccagggtagt gatattgtc
70441 ttcattatct atttttctgt tagagggcag ctctaaggcg ttcatttttg acccttccac
70501 caataagacc ctcaacctcc cagccaggaa gccaatgttg aggttccgc agctgtctaa
70561 tatgtctgtg ccaattatgc atctggcac tgggggaagt accacagtag gactgtggg
70621 agccactgga cctactataa gtcacacttg agctagaact ccattataca cctgacctcc
70681 ataaagccct actttaactg gagcaccaca atgatgtttt aggtccctca aaatcagcgt
70741 caactcagag acagtgtcca gtggtccctg aagtgcctga ttttttctt tctccagagt
70801 cagacttacc ctggtaaaa gctgaatgtc tctctggga aggataggag aaagattaac
70861 agcatacatt tgcagtagg tagtaggttc ctctctcaa gggactgtgc cctcccttcc
70921 tctcaaggtgt tctgggtctg taaactggct caagtctgga agttgactga agggctgtga
70981 tctctgttt ttataattca aatgagctct ttgtcaattc aaactagaag ttttctact
71041 atataaaatt agcaggagtg cagttaggctt cctatcagtt ttaacttctag gaacactgtg
71101 atttaattag caatgccaga gctctataca agtcagacta ttgtgatgtc ttgtttgtc
71161 ctgctgtcca ttacagtgc taagcctgcc ttgctttga ttgtttgagtt ccacactgtc
71221 gt tctgtcca cctcaggatc cagtatttcc cattttattt aaattttgtc cagtgtgac
71281 tgtggttccc actgttagat ctgacataca gggaaagaga ttcttagggc tcttcaagga
71341 tgcagatgct gccctacaaa atctgttttg caaggtgttg gtcaagggtga tctctctgtg
71401 accctccag ctgggtagtg taggtctaaa gtgactaatc tactccacca tcccattctc
71461 cctaagcctt tggatttctt tctctacatt aaaccaaggg acatcaggtc tccagctcgc
71521 tcacagtggg ccatctttta atccttattt cagctaacta agcaaataga ctgttagaac
71581 ctttttttaa actccctaag ctgcaacgtt aaatgcagaa tactacttaa gtgggctgaa
71641 atcaataaatt tcagctctgat ctaattctat gtttcttcca ccattatccc acacccttaa
71701 tatccattcc catccctggt ctccagattt cttctcatat aaattagaaa actcaagaac
71761 tctttttcaa gtgtagtga cctcctcatg ggtcacactc tgaatgtcac cttcaggggc
71821 cgcgcaggag ttatgtctag ttataggtat agaacaaa ca ggggtgttgg ttctgtgtcc
71881 tcaggagaat caacattatc tctcctggca actgcctcag gggaggcatc cactgtttgc
71941 tcaggcagcg cagggtttat ctctcagac aaaggtggaa agaatgtatgg cagtgtgtg
72001 caggaggggg atgatgcgc tactggggat gggaaagctg tttcttctg caagaagggt
72061 tctcagagtg ttacaaggtc agtgcctcca gcttcatcag gttcctcccg gttccccc
72121 tccaagttg caaggttcca tcttttcca atcaatgcct tcaatttaac agtagacatg
72181 gcaagcgtg gcatccacct tctcctgagc ttccagcact cacatgataa cagtcacgt
72241 ctgattttcc acaatttcag ctttctctaa aggaagtaag actctgactc cgtgtcagtc
72301 tagaagatt gagaccacct atctgcctct gaagcagga cagagaactcc aggtctcat
72361 cattttctct catcactttg tccagtgaac tgaggagcaa ccaaccagct tcatttgtt
72421 ctttggttct ccacataatg tcaaaaggtat tatgtataga gtcaactaac ctcttaactc
72481 tccaagtggt taatcagga gtgtccaatg cattaatttt gcctaactct ctaaacagtt
72541 catgccagg actatcagtg ttctccatc tattaagaat agagtctcta gtattttgg
72601 gtctaatcat attaaagcga caactccaga acccccaaaa ctgtataagt actccatct
72661 taattattctg tctctgaga accactcctg gtaccaaat gtctatctag gactgtatg
72721 ctgactaata cagaataatc atctatctat ctatctatct ctacatagg ccactgtgag
72781 aggatatta attcacatga tcaaaaggtc caaagctgaa gaacttggag tctgattgtt
72841 aaggaagctga gtccagcttt caaagctgaa gatgtaggcg gggaggctaa ggtgccacag
72901 actgcctcag atgggaggaa gtgtaggcg gggaggctaa ggtgccacag cagatttaag
72961 tttttctgcc tgcatttat ttgctggcag ctgat tagtt aaatgttaac ctctttggc
73021 ggtggtctgc cttccccag ctctcagct ctctagctca atcaagtga atacttaag
73081 cagacacacc caggatcaat actttgcata aataaagatt agctatgaag gactcagaaa
73141 taactattac atggagttat attaaaatta

73201 ataaggaagac tatgaaaacc tatcagggttc atggcgaagac aattcagcat cagtgtgaaga
73261 ggctctcaact gaccaaaagt gaaatgtgtt tagtatcaaa acgtctaagt actgctaagt
73321 ttgtcaacaa attaagtatg ttggaatgaa tgggttcatg ataataataa ttgaaaaagc
73381 cccattgtatc acctatgaga gacataaaga cccaactcct tattttgaaa actatagaac
73441 gaatagagaga aacacgaacc atactcttaat ttctcatatg aactctgaacc tccaggttaac
73501 cagatagagga agaggagtat ctctttaatt aaataatttta ttctaataat taaaatgaat
73561 aatagaattta gaaaatgtct atttggcagc actaaataaa tggctgtgttc aagctaaacta
73621 tgacgggttca caacaaggga gaagatcagt ttctcagtat caglcatagg ctgttagactt
73681 ttatttggact aagctgtgct cctataaatt ataagtgta taataaaattt attttaaaaa
73741 cctgtctcag attcttgaag tttaaggta taataaaatg aaagaaactg gacagaaatt
73801 gattctctgga ataaggggaag taaacttttg gaaatccaca ttatctctgc ttttaccaaa
73861 ggaccagcag aaaaatagcta gattttacta ggaagtgggg acagaggttca gatttcaagt
73921 tgccagagagc gctagaattt gaggtagggaa tatttagaag aagatcaagag acqaatKggct
73981 cgtgtctcctg cagacacawt tccctcagat ccttggccaa ttcttgaac tcacatgctc
74041 aagggtgaaat gcYaagcagc cctagagaaa gcacgagaaa gagggtttaa agtctaaaga
74101 ttctcagtac tacgtagggc tgggaaggga ccacttttg agttccaagt cctgcaattt
74161 agaggaattt gtttaaacacc ttggagtttt actgaatgc cacaaggtta cctgtccagc
74221 gaatagagat gtgtttttaa aagggaagaa agaaatccca gactgattt cgttgggag
74281 taaagactgtt acctgaggac atattgttat atcctagagc taaggacaaa accaaaagt
74341 acctatccaa caaaacttga aactaaggct tcacagggtc taagtgatca cggctgaatt
74401 caccctccctg tggaccactg ccaatttact cccgcaggt cactccagct cggcactgtc
74461 tctctcaacc tctcaacagg cctcatccct cccataccca cctctccct tttcccaatt
74521 cctctctctt tctctggcgc tgctgacaca tagggttacc tactcagett aaaaagcaet
74581 tctttagagta tatgttttct gaacacaaa caaattttaa tctctgtgtt caaaactctc
74641 ctgtaaccct gtcttttcat tccatgttct ggaacttgta catttgtctt tacatgtgta
74701 cacttggata attacaactt gtaaatatgt acaattacat atctttacta ttttactata
74761 tttttaaata gaccaattgt aattgtacat atttaccac ttgttaagt acatatttga
74821 attataagt gtaatatgtc tgtacacaca ggagattttg cctgtctctt cctctggga
74881 tggagcatcc ttgaggccag gtgtgttccac tgtagcaaca gcagctccca cgttagcaet
74941 tgacacagtc tccaataact atttggttaa ttgggtgatt aaaaaaaatc ccgttatcca
75001 tggatgtaatt tgtatcataa atacataaaa atcacaaatg tatcacctc atacagcagt
75061 aggtgtacaa aagagagata actttgagat aaacgtgatt tcaagttgtt tttatttaa
75121 aatcataaca gtatacaaaa taatgttgaag gcattttgat atttccattt gacccctcta
75181 gcactcttgt gtagtatgag aggcctggaat ttctcagta atagccaaat aaggaactct
75241 agaatacaaa tttaggtgac ttctctgaca ttgcaaaagt tgc aaatgaa tattagacc
75301 aaaaatgcaa cttatYatcct ccggtgatgc attcaagtgt ccttgacata cttgataata
75361 ctaatttcaa atctgttttaa aagattaatt tactatgaca aaatlaagt gagaatgata
75421 atgttttttc ccaataacctg ctggtgtgtt gttactgacc tttaacttga cttctgtgt
75481 agataataag ggcacctttt cctgtgtgtt atataagca ctgtatctct cttctgtgt
75541 cctttttatt gtattatttt tagttgtttt aaacttaaga gtcccttaaat catctgtgt
75601 ctgtttatgc taccatgcga aaatagtata atctatttcc tgttgatttc ttgtagactt
75661 ggtctctctt cctcattgct ttaaaaaacc agttcagtaa tgcagctctc aagtgctat
75721 ctatcatgtM gctacttttaa tatctacta taataatgt aaacagcgac tgcagctgat
75781 tgtgtttctc tagaagtcga aattggacct ctgtttgttt agtaattcat cggcaataac
75841 ttcaaaataa ataaacagta tgaatcagtg taaagctgta cttcattttt aactaagaag
75901 agtttggctc ataccctttt ccagttgatg aaatagctat atatttttt tctctgatct
75961 tgcacaggaa cattctagtt ctattttacat ttggggaga ttccataaga attaataaaa
76021 gacctagtg atctttttcaa tcaactcttc atgacctca aactcagtaa ttttctatt
76081 atttataaatt tgattttcta atttaccat ttctatctc aatttttctc ttttaagttt
76141 ttagtcatct gacctcagca aaaattccaa gatctacat ttccactcaat tttaactatt
76201 atcccgaata catcttcaa ggcacaaatc ctaccacctc cacaattatc ggcagtaacc
76261 acccagataa taataataa aaacatctat ttccatggt taactcaatt cactgtacca
76321 tccaatgatc aatggggtta tttatttca gagaaatgt tcttgggaac tactgttct
76381 tccatcaaa caaccctcat cgtgcatct gctcagaat catttaggga tcttagtctc
76441 tgttccaggt tagaattcca gagatYctaa ttbtgtgaac attatgttct tagtaattca tctgtgggt
76501 tagaattgttg aatgttttat gagatcccaa gggatctctc tagtaattca tctgtgggt
76561 tggaccatag agctcagttc atggtcttga atatttttct tagtaattca tctgtgggt
76621 agaggagacat tgccttttca agtgacaacc cctcaaaatt tgagaaacct caaactctg
76681 gagaagggct aggatgcagg ggtggggaga agataccagg aaacttgaa tatattgcca
76741 tggaggggtg gtgtgtatgt gaaatagcta gtgttgctga aagtttgcg tccaagag
76801 taaagcgttt ttcaaattta gttgagacc ttcttagag ctacagcgga tcaactccat
76861 ctctcctatg tcttagaaat cattcaaat cccagcgtga tacaaaaagc gaactctcc
76921 gacagcagat aataattgca tctcagggtt gtgtgtcttc cccaattgac tataagctc
76981 tcaaaaaaaa caaaaagttt tcttgttttt tatgcatac tctgtcttc accgttatca

77041 caqaaaagctc tccataaata catgctgcag gaaaaaaagc agaagacaca ttccaagaat
 77101 actacactctg acacaactcc ctgaaagata ttggaattat tctcatatgca agctctctaa
 77161 ttccatggcca gatttgtatt ctgaatttgrg taataaagac aaagctataacc tacggRMac
 77221 ggagagaattg atatgagagt agggcgtaaca actcttttga gtctctctctt tctctcgattc
 77281 ttgctgttaaa tgtgaagatt tgagatggag gtattcactg aggggggaatc aggtccaccg
 77341 caattgctgtg taaagtcag ctgggttagg agctgcacga cacagaaaaa gccacagagac
 77401 ccacagatagc cttgaaatca tctctgctgc ataacctggc aatgacattg ataatlaagg
 77461 gttttctatg tacttcaqca attcattatt atttaaaag tgacaaaatgac accaaatgta
 77521 cttatttaaac tattttttgc tatgcacott tctctgccca atattctaac aataaatctct
 77581 agtgcagaca taagtagtta atattcattt attgctaatt tgtgtgcacg tactaaaaac
 77641 taggcagata agcatgcata caacaactct aagaagacta tactattatt ctcatattac
 77701 aaatgagaca acagggacaa agaggttaag taactcactg tgataaagag gataaatcct
 77761 ccctaatatc ttagtccctg aaacctgtaa atatttgttg ttaccatggc aaaaagcctt
 77821 tgcagatgtrc attaaacttag ggaatctaca atggggagat tatttttgtt tatccaggcg
 77881 gacctgatgt aatcacaaag gtcctataaa aagggaagat ggaggcaggg agggagagag
 77941 ggaagaagag gaagatttga agatgctgtg acactgttca catgaaaggaa gaggcacaga
 78001 gccaaagtgt cctcaaaagg tagaaaagac aaagaaatga atattatttt agagacttta
 78061 gaagggtggg gctcctgccca acaccttgat tttaggactt ctaattttcca gaattgttaag
 78121 ataataaaat tgtgatataa taagagacta tgtttgttgt tattttgtttt acacaataaa
 78181 taggaagctg tctgaactct tttattgtgc tataacagaa taattgtaggc tgggttaattt
 78241 attaaaaaat gaggtttatt tagcttatgg ttctgcaggc tgggaagtac aggaagcatg
 78301 gtgctaacta ctgctgggct tctggtgagc gcttttgcag cttctaaagaa tgggagacga
 78361 tcaaaaaggga tgtggaaaag tgcaaaaagg caaaacctga ggggtgtctt gctttatagc
 78421 aacacactct tgcagaacaa aatccattct catgagaact atcagtctcc catgagagag
 78481 ggattcactc actaccctga gaacagccac aaaccttca taagggtact gctcatgtg
 78541 tcaaacctct cctactgggc caaacctccc agcactgccca agaaaataat atactttgtc
 78601 tatgagtttt ggtggagaca aaccacatcc ataccatggc agaaataat atactttgtc
 78661 aagtttgagt gaqtattcaa accagcacag actagttgct taactactga tggcaactgt
 78721 aaatatatat tattagaatg ggctgaaaag gggctagac taaaaaacgg ggaatttgtc
 78781 agaacaaatt gcaactgtgg tcagagaact agagtctata cctgccact agtagcgca
 78841 tgtatgacag agccacatata ttaattctga taataaccga atcaattaaa atataaagt
 78901 taaaattatg ataataata cttaaaataa taataaccga gtaataagac atactaatg
 78961 accaaattcac agttagaanaa ataattctta tcttctcttt cagttaagca aaaaagctcc
 79021 tcttacaact tttagactga ggccttttac ttttacaat ttgtttatc ttcagttatc
 79081 catttttctc atggtcaatt ttataatact tctacttttc ctattttatc aattcaacta
 79141 tgtacaaaag attgtcttcc cagcctgggc aacatggaga aactcattt ctgccaaaa
 79201 tacaaaaaat tagctggaca tgggtggcaaa ttctctgtaSt ctcaactact tggagagctg
 79261 aggctgaggt tggaggttca ctgagcctc ggaggtcagg gctgcagtga tggagatta
 79321 tgccatttga ctcacgccta ggtgacagag ggagaccctg tccaaaaaaa atattttccc
 79381 aaaggatatt acaaaagata ggagtaagta tgatttgac tgttaattta aatatattt
 79441 ttatttttga tcttaatttt agtgtrttca aaataaaat tgatttgtac taatttttagc
 79501 aattctattt actcatatct tcatagatt agtacataac aaagacatac gctcatgaat
 79561 caccctgaaa ttttttatt ttgtatctgt ttgcatgtgt gttgctttt taagagctca
 79621 aatatctgag aatcttttgt gaatagtga aaataatct gttgagtgct aaagattga
 79681 atgttgcttt ctgtgtcatt gatgtgaaat ccaaacgtat gttttcagtt tcaatgttta
 79741 aagtaaaatt tcaaaacata aaacatgaa ttccattcaa atacagaata tcatgtttc
 79801 aaagaagtat ttgattcatt aatgaaggaa tcagaaggat ggttaaaacta gtttcaaa
 79861 aaattcaaga atttgagtg atatatagga atccaggaaa gcatgttaga ataataatt
 79921 taggtagata cgcagaagt taattttcaa caggacaata aacccaatac ttttggaat
 79981 atagtcttca ccagacagaa gcaalltga cctctactga tctctactga gtaataata
 80041 tttaacttta tagaatctgg ccttaattat tattcatlca gtaataataa ttttcaatt
 80101 aatttattaa ttccactaga attaaataa cttaacctgt tgaagatgtg ttctcaatg
 80161 cattggaag atgtgaagtt atttctttgc ttattttatt tccacttttt ttctcaatt
 80221 ttcttcaag tggtaagatc actttcaaga gaactctaac tccatgtaga ttcacagca
 80281 tttttggca gctgagtaact gtccaaaaa tatagaattg aatgtctctt tctctctct
 80341 aaaaagattaa ttttttcagg tttttatatg attaaattt tgccacaata ttcataatg
 80401 tgtaatgttt taagatgatt tttaaaagt atcaaatggg atcaaatgag ttttataaa
 80461 aattgcttat aaaaagtgac ctacaactgag tttataatc taataataac ttttataaa
 80521 catccagaat tttttttcat ttctgagag tctgtttcta tatattaaat tgtattctt
 80581 tgaagttttc tctactgat aatgtactgc cattgtgaat tatactgaac tttttttct
 80641 tgaaggatgt tgtttactgc catgggaaat ctgtgactgc actgtgacca gttttgtat
 80701 tctcgctctt tctactttg tctctttcag gtccctttt tcaaggtgag tcaacctcac
 80761 tctactatgt agtactaaat tatttctgt cactgtagt tctcagcaat cctcagagt
 80821 cctYttatg acagtgaatg ggaagctgt ctaggcctc tgaatttaag

80881 ttgttccaaga gtaatcctag tttatgggga caagttatag gacttgaaga ctgtagaggg
80941 tggccaagatt actgattaa atctcccttt gctctcgttt tctagacctg agaactagg
81001 gagccctttt tcaactacct taagtgaact cagcctctgt ttaactctga tcaagatgcS
81061 ttgttacaacc ttaatgctt ttatgaactt agttgtKtac ttgtcaaaat ttgtctgtct
81121 tccaataatg gaacacacct gagggacagg gccatattta ttgtgaaatt tttaataact
81181 ccagagactcg gcaactgat tcaaacgtga tgggtcaaat aaagtttttat tgaatgaatt
81241 cataagattcg catttgtctg taccgtgaa gcaaggagac agtaagaatt acagaaaattg
81301 caaagtgccc ttggtttaag agtatgcaat tgccttaggc attaagtggt ttatatgttt
81361 ttctctatgc catttttctg attgaaatat tccaggcaca aaagctttag gtgccacaga
81421 agataMatat carcattata attgaaatat taactgtcat agttgcattt aaaaagatac
81481 agtagctaaa gtaacacaag ctaaaaccttt aatgggaaaa attctcttgg tagctaaatt
81541 caaaaatagt ctttacctaa aatgaaatca ttactgtcat agttgcattt aagtgataca
81601 ttaactcgga gataactgca ttgctccaaa ttgttcacga tttaaagtct gtcttactgg
81661 aattttttctt aatttatgtt aatctaataa tcataggatg cattatttgt atttgacaga
81721 gtgttatattt tcccatgccc attcatctag ctatgtaacg aggaaggatt gttaggctaa
81781 cattatttctt tctacagaat gcagatttta ttcatgtgca ctttgglaat gaattctctta
81841 taagcacatt agcaaaaatt gaaaaaaaata aaacctctga gtcttcaaaa gatggctgca
81901 taaaaatggt gaaaaaaatt tgcagggtgg ttgttataga catttccact aaaaatgat
81961 ggataatctg aatcaaatgc atatttgggc ttacaagtag ctataataac ttttgcacat
82021 caaacaagat gagtaaaact gaagtctatt tctgttgaag gaagaagcca gcttaccagt
82081 tgaaaaatct cttcataatt tatttgtatt tttagccttc ttcattttat acataaggtc
82141 actctcaagg gtaattgcct taaaaaaatc tttagctgtg gaaagtgtaga caactccgtc
82201 aggatttcca agtgttatga gttcttttta atgtctcttg ttcaggtgca actgattttg
82261 acagatgtat ttgtaggtta ctggtataac atgacattct tttccagatg aatgagttaa
82321 gagtgatttt gacaataagt agataagaca gtcaagaagt tgaaaaaaac atgtcaatgt
82381 cacagttatg ccacaaaatc tacagaacag accttacaat atcatttaag cagggtcttt
82441 ccaacaatgt ccttgagaag acagaaaaata gtattgcctt taaatactac cactragcca
82501 cagacgggaaa ataagacaaa acacaagaat cagttttaatg tgccttcaag gcttaccgtg
82561 atgagcttat gctatgtgtg tatatttgtg tatagacctt gttacacatc ttgtatggat
82621 aaagaatttt gagatatcaa acccaacttt tctggagcca aaaaaggatt taactt taga
82681 attccaagaa ctccattaaa aaacattgat ttgtaaatat gcaaggatgt ttaagtata
82741 ttaattataa ctttgttgaa tggaaataaga agaaatagcc tttaataata taagaaaaat
82801 gccaggcaca gtggctcacg cctttaatgc cagcactttg ggtggctgag ttgagccat
82861 cgctcaaaccc caggaaatcg agaccagcct gggcaacata ataggagctt catctccgat
82921 aaaaaataac aaattagct gagcatggtta gtgcacctt gtggttccac ttaactcagg
82981 ggttgagggt ggagggtcgc ttgagcctca gaggtcaagg ctgcagtgag ccaagatagt
83041 gtgagtacca ctgcattcca gccctgggtga caaagaagac cctgcctgaa aaatatata
83101 tatgaaattt tgtatatata tatatgaaat tatatatata ttatgagaaat ttaggaaatc
83161 atttaaaatt gtatttctag atcatgaatt ttgtaaacag gttagttaaag actaaaaatga
83221 aatcaacccc atgtgtcaat agggaaattag atgtttggtg gtcatatttt ccttactat
83281 tgactgtgtca gaagctggac tacacagaca gtccctgact tacagagatt caactctacag
83341 ttatttgact ttacagtggt gtgagagaaa tatgcattca taagaaaacca gctcctaagt
83401 acctatccag ccatgctgtc ttccactttc agtgcaagt tcaataaatt acatgagata
83461 ttaaacattc tatataaaaa ttgtttttgt tttagatgat ttgtttcaac taagacttaa
83521 tgtaagtgtt ctgagcatgt ttaaggtagg ctaggctaaa ctatgaggtt ttgttggtta
83581 tgtagattag atgcattttc aactaaacat atttttaact taagatgggt ttatcaggat
83641 ataactccat cattagtga ggagcaactg tatatgcat ttgtatgata cgtatactgc
83701 cttttctcaa tatataatgc atttaaaatg atttaagga aaagatatatt atccttagaa
83761 tgcctctcac tatctttgtt tctaggatca gaagtggttg atcttgatgg aaaaagttaa
83821 cttctctaca gatttgatca aaaaacctg ctcccaatgaa agccacttat tcttttgaaa
83881 ttcaaaaacca tgcagagtga tgggatctta ctccacagg aaggggcaaa tggagatcac
83941 atcacactgc aattaagaag agcaagactc ttttttaact ttaattcaag ttgtagataa
84001 cgggtgaagt ctcaaaaatc tgattattta gatataccct aagtcacttt atcttttat
84061 agcttattctt ttgacagtca gagtgcctta tttttagatt ttatgtgcaa atctgcaaaa atctcaagt
84121 aatatgtctc tttaagttaa aaatgggtca taatttttct agctattttc taacataata aaggaaagga
84181 tttttttaca tagtgtgat agaaccatat aataatgagg ttgtggcaaa gataaaaatt
84241 tgggtcattg aaaaatgttg aggtagttaa aataatgagg ttgtggcaaa gataaaaatt
84301 atcgatgaaa tgagcgtgca atcagtaata atgacaaaaa ctgagagaaat
84361 tacaacaagg ttgagatatt attatatga aacttcgggg aatgcatctc tagtatttga
84421 accggaatgc ttgagaaggag attgcaattt tatgtataga ttgtgttcca cagaagggtta
84481 cctttttttt ttctctttag actgccaata atgtgtgctg tatttttctc cctctcttaag
84541 gtgaagcttaa actgccttcc acttccaccc ttgtcaattg cactctgggc actgctgact
84601 atgatcagca ttggcattca gtgctcattc agcgctttgg caaacaaagt aacttcacag
84661 tggaggaaca caggcatcat ttccatgac ggggagaatt caatctcatt aactctgatt

84721 atgaggtagg atgggtatgt ttcaattaat gctgatttta ttatgtatat gtggtttaat
 84781 cctcccaagg aaaaacact ataaagagcc caccttttca gtaaatcata gaacagggtga
 84841 agcattttccc aaggcagctct aactcacagt ggcagctttc ggtgtatagt acctgWaccct
 84901 tcatctttctc cacagtatgt aaattttattg ttatagaggg agatgactct ttttaccata
 84961 aatatgtatgt cacagaaact catatgcagg aaattctctg caccacaaaa atctttattac
 85021 cacaagcaaa tataggatgt ttgctatgac ttctttgtgt tctagggtat ttgtgagcag
 85081 tatagatttta taaggagaaat gtaccaacaa attgattaat taatttcatta gcaatggatt
 85141 caaatgcctca aatatcaata tgggtStagaa gcgtatctaa ataaaaaatt taataattgg
 85201 tatagatttta aacagatcaa gttttaccat gttataaaga tggattttctg atcgaccagt
 85261 gaattacaaa ccagagatgtg atcagcaact tgtaaaaata aagttctagt ttcaaaaaaa
 85321 gctaaatgca cataaatttg ttttaaatct atatcttaat tttttgtgtg gttagggttat
 85381 gaaaaattga tctgtgtgtg atgattatag ctatacttgc taatcataat taagcagatt
 85441 tttagaaaaat cactaaacaa tattattgat gccatttttc tttctaatag cagctttgga
 85501 gggattccag cactggaaa atcagtgctca ttccccata gaaattttca ttggtgttta
 85561 gaaaatctct attataatgg agtggaatcc attgatttgg ccaagcagca aaaaaccagag
 85621 atcattgtcta tggtagagt ctttatgcga agacattagt aaaaactatat tctttttttc
 85681 cacacagtaa aattcctcca ttttaggttc ccatttgaca tggggtttta gaggactct
 85741 tatttaaatat tttttctttg attggcaata tgcattataa agattgtttc tatgtgaagg
 85801 aattataattt ttggggggcat aattatttta ttttttatg aagtaaaagca gtgtttttat
 85861 ggttgatatatt ttaattttat tgtgatgtca ttactcacag gaggcttaatt tcttttaact
 85921 tgtatttttt tttttttttt tgagatgaag ctctactctg tccaccaggc tggggtgagc
 85981 tggcataaact cggctcact cgacgctccg cctccagat tcaaggcttt cctccactac
 86041 agcctcctga gtagctggga cttgtagctc tgcacaaca cctggctaatt tttttgtata
 86101 ttttgtagag atcaaggtttt gccattgtag ccaggctgat acttaactcc ttgaccttggg
 86161 tggctcggctg cctcagcctt cccaagatgc tgggattaca ggcattgagcc actatgcccc
 86221 cggctgctct tgatttttta aataagatat tccctgacaa acttaccaga tggagctata
 86281 gaggttctctg aatcacagata caaccatgta tattaggagg acatttgaaa aacttgtatt
 86341 ttgcatagat catctcatgat aaataaaaaga gacgaacaga caacagctata tgaagaacat
 86401 cacatgttagg aaatctgcac caagagatct tactaccgca agcaaataca ggtgtgttta
 86461 caatattgca tggcccaatc tgtccaaatg gcaattgttg tSagacttca ttacatttcta
 86521 attctgttga aacggggaca atttaaatat agctgtcttg gttaggttct agttaggaaa
 86581 cagcagccaa tgcaggatgt tgtgaacagt ggaatcttat taggacttgg acctgagcaa
 86641 ttttcagagg aactaaaaaa tgaatggcct ggcaaggga gtcgaggat acagagaagc
 86701 attaatcttg cccaagcag tgaatgtgtg aggcattgtg ggcattacag acRttttatg
 86761 cctagaggagg ttgaagagaa ctttggcagt tgtgctctgt gggtagccac acccctgtg
 86821 tgtccccagc catgcatcca gcgatgggcc tgggcttgc tgggtctgtg tgggccagct
 86881 gtccaggaaga agagatgggc catagtcgag gagagcaagg acagactgga accaaaaccagc
 86941 Ygctgtgtga caccctctca tgcacatga ttagaaaaac aaccttaggg ccaaaatgtg
 87001 ttgctgggtgt ttttaattcta actatcaagt atcacccaag ctctcttttt tggcctttac
 87061 tcagaagcag acaagtaagg ggaatcctgg tctagctttta ccagttttgat
 87121 aataaaaatc aggcacatat tgatttgaat aaatttcttt catctgtctaa aactccaaagt
 87181 ggtgttaatt aagctcatgt gtcagcaaat cccaagacac atcacagtgt taattttagt
 87241 ttaaacagca ttttatttct aattatgtga attgttggtt tttatattgac caaacacgac
 87301 agcaagatgt taaaatagta tttttaataa aagcaaaatt atttaaaata aaaaataaaa
 87361 taatttatag atagtgtgt gtgtgtgtgt gtgtgtgtgt tttgtgttat tttatccata
 87421 aaatgagttt ctgaaaaactg caaggaccat ctactcttca tgggcaagag gatttgcctg
 87481 tggtaagcta tcatgcagct atccaaatga tgcataagat caagctgcag gttattgggt
 87541 acaaaaatat gattagaaga aagaggggca ataaattcta attttcaata gtcacagtagg
 87601 gcgactaatg ttaataagga ttlatagat atttcaaaat agctacaaaga taagttttgt
 87661 aaatgttctca acacaaagaa aagataaaa tttgaaatga ttggacaacc aattatcccg
 87721 atttgcctat tacgttatt atatatgtat caaaaatca catgtgcctc ataaatata
 87781 acaactatta tgtatcacta agaaaaaaga ccaagctgca gctggctaaa attttttt
 87841 tttttttccct aggtttgata gtcttaaaat tgcctttaca catatgggtt agtgaattgt
 87901 gctgtttcact ttttgttatt tcatctatg gaacacattg tttgttata ataaagtatt
 87961 atttcaatttt cacagattca taatagagcc aaatgtgtt ttttgacca atccaaagt
 88021 tttattccaa tgtgtattct tctaataaag cttagtctca ttgactttta attttatt
 88081 aaagtgtgga aatggagaga agagcagagc aaagggttga agaaccttta agaaattga
 88141 cagtgtgtgga gactgtcatg ttgtagcagc gcagtgttt tttaactcggt ataatgtagg
 88201 ttgaaaaagg agccttcaaa ttctgttact aatgtgatgt gaataaacat ctgaagactt
 88261 tttcttttac ttttttctca gggaaaatgt tctattttct gttcacacc atcaattatg
 88321 cccgtgaact ttctgagctc caggagttat tttagcactgc cagactctct tggagaggag
 88381 gagggtttct ccaattttca atttgcgaact tggaaaagg gcaggctctc gctgtctagt
 88441 gaactctcga tgaattcagg gggatctctc ctctttctga ggtgtgaaa acttaagtcc
 88501 aattctctacc agccaggaaa attaccagat gacatcagc catgataaa atgtattccc

88561 tggggcaaa catatggatt tgaagattt cattatctct gtggccaaat tttatgcata
88621 acaaaaatg taatatattgc ttaataaagt taataaagt taataagtact
88681 ctctccctaga ggaacttgat tccaattttc ttttaaatat ggttcccaaca ctgacgtct
88741 ttaatttaacca aatgatagt tttggggaac tgaagttlcc tttcacRacc ctgctctcca
88801 ctccagacaa agaacatact ctaaggatgt gtgttttggg gaagaccatga agacettgaa
88861 atagagcaac aagtttaacta agtgttcttc aatggaaaac taagactcttc ctcaacactc
88921 tgtatgtctt atctgtgtctg tgagaaaaag ggagaggtct tctctgggact tatatctata
88981 tctctgtatgt agtgcacagt gtgaatggta acttttattg ctgatgtctt ctgtaaagag
89041 tttgaatacat tttgagggga tgcaaaagatt tatgcaagat tctctcagtgt tcccaaaagt
89101 aaattctctc tacttctaggt caatacggta ttgttttaat gatitagaagt aaatctctgt
89161 aggtgactat atgagtatct ggataatgaa tgtctaattt agggccagtgc gtgagtgag
89221 ggatgttttt gtctctctat taaaattata aagttcttga caaaagctct acatcacatt
89281 tttacgtatg tacaatggca tccaagccaa gcaactagag gttgccttgg ggtaaatctg
89341 tacatttaatt taataaataa tctttaaaaa caacttaag attccattgt actactctc
89401 tatatttaagt atgacccaaa aatagtggaa tgaacttgg agagagagaa aaaaatgaga
89461 gttaaaatac agttgaaaat taaatccgag aaaaacagta tacaatagg tatacaaatg
89521 cctatttatt atatgtcttt ttgttctgt actactattg tagttttaaatt accggaaccga
89581 gaattctgata ttagtataa tttttaaaga gatactatgc tgtgactttt tatttaagt
89641 tcaaaatgtg tagattttgc tggctagaca aaaaagaaat aatlaaatgag tctcatattg
89701 taataataata ggccctgaaa atgaaggtct aaaaatgtaa gtttgcatt ctgtatgtat
89761 ttatttggat gtatctgaca tcttctgaag tggttatatt catcacctaa ttttcagcat
89821 cttaagagaa ccgcttcagt gcaacgttac tttggggagc tccatgaagt cagcctattg
89881 cttctctttt tttttttttt tttctgagat ggagtttggc tcttgttggc caggtctggag
89941 tgttatgttg caatctcagc tcaccgcaac cgcgcctcc cgggttcaag cttacttctg
90001 gccctcagct cccaagttaac tgggattaca ggcattgtgc accacaccca ctcaattttg
90061 tattttttag ttgagacaggt gtttctccat gttgatcagg gctgaagcag tccattatgt
90121 accgcttacc aagcatgtat agttaataa ttactaggt taagtctcat agaataacct
90181 gagggtattta aaaaatttcta aatgaatgt taaattctat taataataa tctgttatg
90241 catcatctga cttgttatga ttattttcat actaatcata aggataactg actaaatattg
90301 aatgtcagta cactgaggt aacacagta ggaatttatt taaaaacct cttactctt
90361 ttttttccgt ttcttccaca atattatttt ttgctagtgc ccgtgaagca agtactttt
90421 gcatttggaa atagactatt taaatggtag ttgggtgaaa ggtcagctgt tctcccaag
90481 gggagagact tccatttatg ttttatgtat gcgacactgt ataattaaac cagtgtcag
90541 gatgttatat aatgactttc aagagaccaa tgtcttat tctttataa tatcacattg
90601 tactaaatct ttctattata taaggatgga ttaatttttc tcaagtactg gagaatattt
90661 ttacaaaatct tatatgtttg aaaaactcaa cattttaata tattttataa tgaaattaa
90721 attaaatgt attgagaag aactgaattg tcaaatgtct tgaattatca gactaaattg
90781 ttaatatgt gtacagtttt gcaaatgtc atttggaaat attcaaaaat attatgtcag
90841 cttaactcat ttttgaata ttcaacacat tatattagta taaactatga aacatattg
90901 catcaactata aatccctta tgacacaaaa tatttttagt cgttgcacc aagtttttg
90961 tcaaaagcaaa aatcaatgag cagtacagtt atgtttccc atttaaaaca tttttttg
91021 taacaaaatt gagatttctg ctatgatttt agcatttctg ctgctgaacag
91081 tgaaaactcag gcttataacc atgcctcttg tcccatggg cagggctgct cagaggcag
91141 ctctcagtat ttgagatgtt tctgactttt tctattacta cgaattctca attctctgtg
91201 ctctgacaa ggagcagccc ccttgatttg ctgcacccag gagagcattt ttgttcaat
91261 cactctcttc cctttcactg ttgaaatatt cctaacttcc gggctgtaa cctgtcaccc
91321 tttaaaccttc tgcctctccc caaagtgtat ggtacacacc acctccatatt ttctctgt
91381 acaagagctc tctgtaact tgaatcctta attctggtta gtgactacgg ttagtgga
91441 taagaatgtc tggcacttca gtgcgtgaa atacgttgg aaagaggcaa accctttg
91501 ttttttccgt aggaatggcc taggtataat tgccttttgc acctttctgt acccttacc
91561 ctatatggca ggctaatttt tttcttata cattgtgac tacagatag tgtgtagt
91621 ttatgagaggt gtatgacaa ctaagctctc atgtttctga tgcactttag gactggaact
91681 agagagcagat ctgtagaatg gaagttagac taaatctttt tctctctgt gttttttg
91741 tgttttatgtg gtttagcgt gaagacagaa tccaacgtgt aatgtcgaac acttccatct
91801 gagacgttc acttccata tctccattg cattgtcaat tattgcaaca ccaagactg
91861 actatctcat ccttccata tccaattgg atttatgtct tttgcaaca cagagaaac
91921 aataaactata tctggagtt aacaagtga atttatgtct cttgcaaca gatttgggt
91981 accttggaaa ccaacggtt tctgaagaca aagttgttag atttgcattg actaaatgt
92041 tgtgttagct gatttggagg aggtttcagg gaagtgaata atgtctgtac actaaatgt
92101 gtcacgaggt gagggttaatt ctatgataa atactctgt gaaccttat tagaaggtg
92161 aataaagca gtaaggctaa agttgttaatt ggtaaatata gaacaaaca gttgtctatt
92221 cataagatc aggagagaaa gaagtttggg tttttaggt ttgtacata cctgtgtct
92281 tgtctgtgtt tagacaaagt tataagtgt catgatttt cccaccttc attcaatata
92341 atgtcacagaa tggcctgtc tgaatgtgtt gttctgtgtt atgtgtgat tttcacagaa

92401 gaacacccaaa gccacgacct cagtgccagc cagattctta caacacccaa gtctcactgg
 92461 tggtaaccag cgtgtcccta cgtgtgcccg cctatttttc tttagagttaa tttgttaata
 92521 tgagcaaaaa ataaaaaaa taaaataaag taaggcagac acctgtcttg cagacacgga
 92581 agagtgtagg ttttggaqtc agtcctgggt ttctgttttc cctcagctat ccagcagctg
 92641 gatgtgacct cggtagtttc ttttcccttc tgagcctcat ttttccgta ttaaaaggtga
 92701 gaatgataag ttatagtgaa gattaaatga tactatgcat agaaagctcc cagattttgt
 92761 tataagtaat acctcaataa aattactatt ttattattat gacaacatgt tcttccccag
 92821 acctaaaagt tatgagtgtt gggactgggt gcataaatt ttcaattact taccaaatat
 92881 caqaaacagc aaaaaaaatt caaattctat gattttctct tctcttctct gtttcacagt
 92941 ggtgcggccc ttgaaaaagg ccaacctatt atcagacct a gtaacggaaa gatttaagt
 93001 agctacaaaa caattagaaat ctaatttaaa attaggtaga gttagttgaa atgagttaaa
 93061 gggacatttt gtgatttgag taataaattc caattgacag gatttaagct tccctcatcat
 93121 aggcacaaata tttttgttac aaaggaggct tgggaaaaagc tttctgaagg tctcccccaa
 93181 aacatggcac aacttcattc tattcacaa cgtgaacctg ctgtaacctg ctagctgttt
 93241 gtttaaatgt gtgcccattt acagagtggtt ttactctggc agtcttttgi tctctgatcta
 93301 ttttttgcct ctgatggag agtaggcctc cccaagcctt ttagttaact cgtgctcatg
 93361 cctaaccact gactgccagc agccctgcta ctcaaagat gggctcctga ccagcactgt
 93421 cctagtgaaa tacttttaac tgatctatga tgagatgaat gttaaaaatt agttaaatct
 93481 cctagaaact ggtaaaaaa gatcactgca acatctaaag acatgggttag tgggcttgta
 93541 ttttatgtct tttttattgt ttattttact ttttaatttt agatttgattt agatttgattt
 93601 gtacaaagtc aggtgtgtac atgggtatata tgcatgggtg tgagatttgg gtttcaattg
 93661 aacccatgac ccaataaatg aacatggtaa ctgataggta gtttttaaat tttctcccca
 93721 tgccctctcc ccttttgaag ttcccagtcg ctgttttccc catctgtatg accatgtgta
 93781 cccagtgatt agctccact tacaagttag aacatgctgt attgtgtttt ctgtttttgt
 93841 gtttaactgc tttagataat agtctccagc tgcatctgtg ttgtctgaaa caatgttatt
 93901 ccatctcttt ctctgctac ataataatct gtatgtata ttgtgccaat tttctttatc
 93961 caacccatca ttgatgggca cctaggttga ttccatgctc ctgctattgt aaataatact
 94021 acaataaata cgtgaatgca ggcatctttt ttgttcagtg gttctcaacc tttttggcac
 94081 caggagactgt ttcatgaaa gacaattttt ctagggactg taatgttggg ggtatgtttc
 94141 aggatcattc gagcaaat aatttattat gtaacttatt tctattatata ttgtaataata
 94201 tagtgaaata attatacaac tcatcataat gtggaatcag tgggagctct aagcattaga
 94261 tcttgcaact agattgacct atctgggggt gatttgagac agtgacaaac gactgtgtt
 94321 ttctcattag gagtggtcaa cctagatccc tcgcatgtgc agttcacaaat aggggtcgaa
 94381 ctcttaggaa aatctaagtc tggcagtgat ctgataggag gcagagctca ggttgtaagt
 94441 caagttagat gagcagctgt aaatacagct tcaactgcct gccagccact cactctctgc
 94501 tgtgtgaccc agttcctaac aggccacaga cctggtatcg gtccatggcc ctggggattg
 94561 gggacgccta tttttgttag aatgacttat ttctctctg gtatagaccc agtaatggga
 94621 ttgctgggtc gaatagtaat tctactttta gttcttttag aaactcccaa actgctttcc
 94681 acagaagctg aactaattta cagttccccc ttttttttct tttagccttg ccaaaatcta
 94741 ttttttttag aatttatttt catcataatt tataaaagta tcaatttgca atagatcaga
 94801 taataaaatt ttcatcccca cagatagttt gagaagaact gttggacacc agtggaagat
 94861 ctaaaattgaa atagagaaag tagagctctg cacacagggc tttagaagat agatgtcgga
 94921 gaaatgccag gggcaggttg gtagaatata cagctgacac agagagtgta taagaaattt
 94981 ctctctaagt gagtgaatc tatcttaaaag gaagcactgag atgacaaaac taggacatct
 95041 gatttatttt aatccagtc tgtaaccatca aggatataat aactctatct agctgtctat
 95101 ttcagagctc aactctagaa aatgtgtcta accatcattc agactttgggt ttcccatctc
 95161 agttttcagc cctttcccat tatcttacac aaaccaaac agagtttgggt ctccagtta
 95221 ctttttttgc ttcatggatg tgatgtaaaa gtgagcttct gtgctctggc taaaatttgt
 95281 gtttagacct atagtccag ggcaaaagaca tgtaatcacc taaggagatt tttagatcat
 95341 ttgtatccaa atgtatgtg tagaaaatct tcggganaat aaaaagaaat acatatacat
 95401 catattttat taaacttctt ttacataaaa tcagttaaga aatcacatgc aaatacagaa
 95461 aaaaagctgt ttggttttga tagattgctt attttttgt tctctaatct gatctcgaga
 95521 atcacacaga gtgactatt caaatggatg taacctcagc ttgtaaaatt acgacaaaga
 95581 cctcttagatt tcaacctcngc tcaacattta gctcacagc tctctgtaga ccttagagtg
 95641 tgtaagagga aagctctatg catctctgat gattcatgac actggggcct ccttagagag
 95701 gactagagat tgccttttga aggtgataag aatacctcga tttttgattt tagcaacttt
 95761 tgactttata catgtctaca tatataaaa cttggaaaat

[0288] Following are cDNA sequences for *PADI2* (SEQ ID NO: 7), *APOB* (SEQ ID NO: 8), *IL1RL2* (SEQ ID NO: 9), *WASPIP* (SEQ ID NO: 10), *BVES* (SEQ ID NO: 11 and 12), *PELI2* (SEQ ID NO: 13), *LOXL1* (SEQ ID NO: 14), *CASPR4* (SEQ ID NO: 15 and 16) and *GPR50* (SEQ ID NO: 17).

PADI2 cDNA sequence (SEQ ID NO: 7)

NM_007365 Homo sapiens peptidyl arginine deiminase, type II (*PADI2*), mRNA

```

1  cgcacctgct  gcaggtgctc  ccggccgc  cggaccacg  agcgcggc  ctgcggcgg
61  gaggatgctg  cgcgagcgga  ccgtgcgg  gcagtacgg  agccgcgtg  agccggtgt
121  ctcgtcgtgg  acctacctct  ggaccagtg  ctacagcgc  gccccagcc  ggcccaaac
181  cttcagcctg  aagcactcgg  aacacgtgt  ggtggaggtg  gtgcgtgatg  ggagggctga
241  ggaggtggcc  accaatggca  agcagcgctg  gcttctctcg  ccagcaccac  cctcgtgggt
301  caccatgagc  caggcgagca  ccgagggc  cagtacaa  gtaccgtca  actactatga
361  cgaggaaagg  agcattccca  tcgaccagg  ggggctcttc  ctacagacca  ttgagatctc
421  cctggatgtg  gacgcagacc  gggatggtg  ggtggagaag  aacaaaccaa  agagggcatc
481  ctccgctctg  ggccccgagg  gccagggg  catcctcgtg  gtgaactgtg  accgagagac
541  acctcgtgtg  cccaaggagg  actgccgtg  tgagaagg  tacagcaagg  aagatctcaa
601  ggacatgtcc  cagatgatcc  tgcggacca  agggcccg  cgcctcccg  ccgatatcaa
661  gatgttctg  tacatttcca  gtccagact  agacaaagt  ggcgtgttct  acgtggagaa
721  cccgttcttc  ggccaaacgt  atatccacat  cctggggcgg  cggaagctct  accatgtggt
781  caagtacacg  ggtggtctcg  cggagctgct  gttcttcgtg  gaaggcctct  gtttcccaga
841  cgagggtctc  tcaggcctgg  tctccatcca  tgtcagcctg  ctggagtaca  tggcccagaa
901  cacttccctg  actcccatct  tcacggacac  cgtgatattc  cggattgtct  cgtggatcat
961  gaccccaaac  atctcgcttc  ccgtgtcggt  gtttgtgtgc  tgcattgaag  ataattacct
1021  gtctctgaaa  gaggtaga  acctgtgga  gaaaacaa  tgtgagctga  aggtctgtct
1081  ccagtatccta  aaccgaggcg  atcgtcggt  ccaggatgaa  attgagtttg  gctacatcga
1141  ggcceccact  aaagccttcc  ccgtggtgtg  ggactctccc  cgagatggaa  acctaaagaa
1201  ctctccctgtg  aaggagctcc  tgggcccg  ttttggctac  gtgaccgggg  agccctctct
1261  tgagtctgtg  accagccttg  actcatttgg  aaacctggag  gtacgctccc  actatgtctt
1321  gaacggcaag  acatacccg  ttggccgcat  cctcatcg  agcagcttcc  ctctgtctgt
1381  tggtcgagg  atgacaaagg  tgggtcggtg  ctctctgaag  gccacgacgg  tgcaggaccc
1441  cgtggagctc  taactcagact  ggtcgtcgt  gggccacgtg  gatgatctca  tgtcctttgt
1501  ccccatcccc  ggacaaaaga  aattcctgct  actcatggcc  agcactctgg  cctgctacaa
1561  gctcttccga  gagaagcaga  aggacggcca  tggagaggcc  atcatgtcca  aagccttggg
1621  tgggatgagc  agcaagcgaa  tcaccatcaa  caagattctg  tccaacgaga  gcttgtgga
1681  ggagaaacctg  taactccagc  gctgcctgga  ctggaaacct  gacatctcca  agaaggagct
1741  gggagctgaca  gacgaggaca  tcaattgact  gcccgctgt  tccaagatgg  accgaggacca
1801  ccgtgccaga  gccttcttcc  caaacatggt  gaacatgatc  gtgctggaga  aggacctggg
1861  catccccaa  ccatctgggc  cacagggtga  ggaggaatgc  tgacctggcg  tgcagctggg
1921  tggcctctgt  gagccctctg  gcctcgaatg  cacccttcat  gaagacattt  ctgcctacca
1981  caaatctctg  ggggaagctc  actgtggcac  caacgtccgc  aggaagccct  tcaacttcaa
2041  gtggttgac  atggtgccct  gacctggcag  gggccctggc  gtttgcctcc  ttccgttagt
2101  tctccagacc  ctccctcaca  cggccagagc  ctctgtcgtg  catggactgg  acagcccggc
2161  tgggaagacc  ttgggaagctg  ggggtggaat  tggggtatct  gtgccttgcc  ctccctgaga
2221  gctgctctcg  ttgctcttga  agccatccc  agtgagctc  agactgtgtc  gactctgaaa
2281  tagctggggc  agtgtctctg  tagccctgac  ataggaaca  gaacacaa  aaacacagca
2341  aacctgt

```

APOB cDNA sequence (SEQ ID NO: 8)

NM_000384 Homo sapiens apolipoprotein B (including Ag(x) antigen) (*APOB*), mRNA

```

1  attccacag  ggacctcgg  ggtcgtgct  ccttctcgt  tgcctgcc  gaggagccc
61  ccagccagc  caggcccg  agcccgagc  ccagcagcc  cccaccgc  gccccacgc
121  agctgcgat  agaccgcgc  agcccgac  tgcctggct  gctggcgt  ctgcgcgtg
181  tctcgtcgt  gctgcgggc  gccaggcgc  aagagaaat  gctgaaat  gtcacgtgg
241  tctgtccaa  agatgcgac  cgattcaag  acctccgaa  gtacacata  aactatcgg

```

301 ctgaggagttc cagtggagtc cctgggactg ctgattcaag aagtgccacc aggcataact
302 ctgaagtttga cgtggaggtt ccccaagctct cctgaagacc agcaggttgc
421 cccctgaaaga ggtgtatggc ttcaaccctg agggcgaagc ctgtctgaag aaacacaaaga
481 acgttgaggga gtttgcgtca gccatgtcca ggtatgagct caagctgctg attccagaag
501 gggagcaggtt ttctctttac ccggagaaga atgaacctac ttacatctgt aacatcaaga
601 gggagcatcat ttctgccctc ctggttcccc cagagacaga agaaagctga caaggtttgt
661 ttctggatcac cgtgtatgga aactgctcca ctcaactttac cgtcaagacc aggaagggga
721 atgtggccaac agaaatatcc actgaagaag acctggggga cgtgtactgc ttcaagccca
781 tccgcacagag catcagccca ctgtctctca tcaaaagcat gacccgcccc ttgtcaactc
841 tggatcacag cagccagctc tgtcagtaca cactggacgc taagaggaag catgtggcag
901 aagccatctc caaggagcaa caccctctcc tgctttcttc ctacaacaat aagatggga
961 tggtagcaca agtgacacag actttgaaac ttgaagacac accaaagatc aacagccgct
1021 tcttttggtga aggtactaag aagatgggccc tcgcatttga cagcaccaaa tccactatcc
1081 ctccaaagca ggcgaagct gttttgaaga ctctccagga actgaaaaaa ctacaactat
1141 ctgagcaaaa tatccagaga gctaactctc tcaataagct ggttactgag ctgagagggc
1201 tcaagtatga agcagtcaca tctctcttgc cacagctgat tgaggtgtcc accccatcac
1261 ctttcaagc cgtggttccag tgtggacagc ctcaagtctc cactcacctc ctccagtggc
1321 tgaacactggt ctatgccaac cccctctgga tagatgtggt cactcacctc gtggccctga
1381 tccccgagcc ctcagcacag cagctgcgag agatcttcaa catggcgagg gatcacgca
1441 gcgcagccac cttgtatgcg ctgagccacg cggctcaaaa ctatcataa acaaacctta
1501 cagggaacca ggaagctgctg gacattgtcta attacctgat ggaacagatt caagatgat
1561 gcactgggga tgaagattac acctatttga ttctgcgggt cattgaaaa atggggcaaa
1621 ccatggagca gttaaactcca gaactcaagt cttcaactct caaatgtgtc caaagtacaa
1681 agcatcact gatgatccag aaagctgcca tccaggctct cgggaaatgt gaggctaaag
1741 acaaggacca ggaagtttctt ctcaagactt tctcttcaaa gtccttgatga tgccttcccg ggagataaag
1801 gactggctgc ctatcttatg ttgatgagga gtccttcaaa ggcagatatt acaaaaattg
1861 tccaaattctt accatgggaa cagaatgagc aagtgaagaa ctttgtgtct tccatattg
1921 ccaatattct gaactcagaa gaattggata tccaagatct tccaagatct gtaagaagag
1981 ctttgaaaga atctcaactt ccaactgtca tggacttcag aaaattctct cgggaactat
2041 aactctacaa atctgtttct ctccatcac ttgaccacgc ctccagcaaa atagaaggga
2101 attctatatct tgatccaaat aactaccctc ctaagaagaag catgctgaaa actaccctca
2161 ctgctctttg atttgcttca gctgaactca ctgagattgg ctctggaaga aaagcttttg
2221 agccaacatt ggaagctctt ttggggaagc aaggattttt cccagacagt gtcaacaaat
2281 ctttgtactg ggttaatggc caagtctctg aggtgtctct taaggttctta gtgcacaaat
2341 ttggtctatc caaagatgat aaacatgagc aggatattgtt aaatggaata atgctcagtg
2401 ttgagaagct gattaaagat ttgaaatcca aagaagtccc ggaagccaga gccactctcc
2461 gcatcttggg agaggagctt ggttttgcca gtcctcatga cctccagctc ctgggaaagc
2521 tcttctgat ggttgcccgc actctgcagg ggatcccca gatgattgga gaggteatca
2581 ggaagggctc aaagaatgac tttttctctc actacatctt catggagaat gcccttgaac
2641 tcccactgg agctggatta cagttgcaaa tatcttcatc tggagctatt gtcccggag
2701 ccaaggtctg agtaaaaactg gaagtggcca acatcgagcc tgaactgttg gcaaaacctc
2761 ccgtgtctgt ggaagtttgg acaaatatgg gcatcatcat tccggagctc gtataggagt
2821 ggttcagat gaacaccaac ttcttccacg agtcgggtct ccccaaggag ggaggtctat gttgccctca
2881 aagctgggaa cgtgaagttt atcatctctt ccccaaggag accagtcaga ctgctcagt
2941 gaggaacac atacatttg gtctctacca ccaaaacgga ggtgatccca cctctcattg
3001 agaacaggca gtctcgttca gtttgcaagc aagtccttcc tggcctgaat tactgcacct
3061 caggcgctta ctccaacgcc agctccaag actccgctc ctactatctg ctgacggggc
3121 acacagactt agagctggaa ctgagggcta caggagagat caggagagat tctgtcaagc
3181 caactctatga gctccagaga gaggacagag ccttggtgga taccctgaag ttgttaactc
3241 agcagagaag tgcgaagcag actgaggcta ccatgacatt caaataatct ccgacagata
3301 tgactctgtc cagtgaagtc caaat tccgg attttgatgt tgacctcgga acaatctcca
3361 gagttaatga tgaactctac gagggcaaaa cgtctatagc ctccaccctg gacatccaga
3421 acaagaaat tactgaggtc gccctcatgg gccactcaag ttgtgacaca aaggaagaaa
3481 gaaaaatcaa ggggtttatt tccaatcccc ttctgaccca agaaagagca agtgagatga
3541 tcgcccactg gtccctctgcc aaactgcttc tccaatgga ctcatctgct acagcttatg
3601 gctccacagt ttccaagagg gtggcatggc attatgatga agagaagatt gaatttgaat
3661 ggacacagag caccatgta gataccaaaa aaatgacttc caatttccct gtgagctctc
3721 cgttatctc taagagcttg catatgtatg ctaatagact cctggatccac agactccctg
3781 aacagacat gactttccgg cagtggtgtt ccaaatat agttgcaatg actcatctg
3841 tccagaagcc actctggagt ctctctata gccagactct ccaactccca acatagacc
3901 tgaaggaggt caacctccag aaacatggat tggcagactt cccactccca gaaaacctct
3961 tcttaaaaag cgtggccgg ctcaaatata ccttgacaaa gaacagtttg aaatttga
4021 tctctttgct ttgtggtggc aaactctcaa gagactcaaa atctcgagag actcgttaga
4081 caccagccct ccaactcaag tctgtgggat tctgtgagc ttccagagct

4141 ctactctttac cattcccaag ttgtatcaac tgcaagtgc tctctgggt gttctagacc
4201 tctccacgaa ttctacagc aactgtgaca actggtccgc ctctacagt ggtggcaaca
4261 ccagcacaga ccaattcagc ctctgggctc gttaccacat gaaggtgctc ttctgtgtt
4321 acctgtcttc tcaaatgtg caaggatctg gagaacaac atatgaccac aagaatacgt
4381 tcaactatct atgtgatggg tctctacgac acaaatctct agatctgaat atcaaatcca
4441 gtcatgtaga aaaaacttga aacaaccagc tctcaaaagg tttaactata tctgatgatc
4501 ctagtctctg gggaccacag atgtctgtct cagttcattt ggaactccaa aagaacaacg
4561 attttattgt caaagaagtc aaagattgat ggcagttcag agtctctctc ttctatgcta
4621 aaggcacata tggcctgtct tgtcagagag atctcaaac tgcccggtctc aatgggagat
4681 ccaactctgag gtttaactcc tctactctcc aaggcaccaa ccagatacaa gaagatgatg
4741 aagatgggac cctctccctc acctccacct ctgactctga aagtggcact attaaaaata
4801 ctgctccctc aaagtatgag aactacgagc tgactttaaa atctgacacc aatgggaagt
4861 ataagaactt tggccactct aacaagatgg atatgacctt ctctacgcaa aatgcactgc
4921 tggcttctga atatcaggct gattacgagt cattgagttt ctctacgagct ctctctggat
4981 cactaaatct ccatgtgtct gagttaaatg ctgacactct aggcactgac aaaaataata
5041 gtgtgtctca caaggcgaca ctaaggattg ccaagatggg aatctacc agtccaacga
5101 ccaactgtga gtgtagtctc ctgtgtctg agaatgagct gaatgcagag ctgggctctc
5161 ctggggcact tatgaattta acaacaagt gcgctctcag ggaacacaa gcaaaattca
5221 gtctggatgg gaaagccgac ctccacagagc tatcactggg aagtgtctat caggccatga
5281 ttctgtgtgt cgacagcaaa aacattttca actctaaagt cagtcaagaa ggaactaagc
5341 tctcaaatga catgatgggc tcatatgctg aaaaataatt tgaccacaca aacagctctga
5401 acattgcagg ctctacactg gacttctctt caaactttga caaactttac agctctgaca
5461 agttttataa gcaaaactgtt aatttacagc tcacagcccta ttctctggta actactttaa
5521 acagtgacct gaatacaat gctctggatc taccacaaca tgggaaacta cggctagaac
5581 cctgtgaagt gcatgtggct ggtaacctaa caggagcccta ccaaaaataa gaataaaca
5641 acatctatgc catctctctc gctgccttat cagcaagcta taagacagac actgttgcta
5701 aggtctcagg gtgtgagttt agccatcgcc tcaacacaga catcgctggc ctgtctcag
5761 ccaatgcatg gacgacaaac tataattcag actcactgca ttctagcaat gctctcctgt
5821 ctgtaattgg ccggtttacc atgaccatcg atgcacatc aatgtgcaat gggaaactcg
5881 ctctctgggg agaacaatac gggcagctgt atagcaaat cctgttgtaa gcagaacctc
5941 tggcatttac ttctctcat gatataaaag tctccacaga tcatcatctc gtgtctagga
6001 aagatcagc tgcagctctt gaacacaaag tcaagtcctc gcttactcca gctgcagaga
6061 caggcacctg gaaactcaag acccaattta acaacaatga atacagccag gacttgatg
6121 cttaacaacac taagataaaa attggcgctg agcttactcg acgaactctg gctgacctaa
6181 ctctactaga ctccccaatt aaagtggcac ttttactcag tgagcccatc aatgcatgt
6241 atgctttaga gatgagagat gcgcttgaga agcccaaaga atttacaatt gtgtctttg
6301 taaagtatga taaaaccaca gatgttcaat ccaataacct ccaattttt gagactctg
6361 aagaatatgt tgagaggaaat cgacaaacca ttatagttgt agtggaaaac gtacagagaa
6421 acctgaagca catcaatatt gatcaatttg taagaaaata caqagcagcc ctgggaaaac
6481 tccacacaga agctaattgat tatctgaatt cattcaattg ggagagacaa gtttcacatg
6541 ccaaggagaa actgactgct ctccaaaaaa agtatagaat tacagaaaaa gatatacaaa
6601 ttgcatatga tgaagccaaa atcaacttta atgaaaact atctcaactc cagacataata
6661 tgatacaatt tgatcagtat attaaagata gttatgattt acatgtattg aaaaatgcta
6721 ttgctaatat tattgatgaa atcattgaaa atttaaaaag tcttgatagg cactatcata
6781 tccgtgtaaa tttagtaaaa acaattccat atctacattt gtttatgaa aatatgatt
6841 ttaacaaaag tggaaagtat actgcactct ggatctcaaa ttgggactag aatgaccaaa
6901 tcagaatcca gatacaagaa aaactgcagc agcttaagag acacatacag aatatgaca
6961 tccagcacct agctggaaag ttaaaaacac acattgagcc attgatgtg aatgaccaaa
7021 tagatcaatt gggaaactca atttcatttg aaagaataaa tgatgttctt gagactgtca
7081 aacactttgt tataaatctt atttgggatt ttgaagttag tgagaaaact aatgccttca
7141 gagccaaagt ccatgagttt atcgagaggt atgaagtga ccaacaactc caggttttaa
7201 tggatataat atagagtttg acccaactat acaagttgaa ggaagactat cagaagctaa
7261 gcaatgtctc acaacaagtt aagataaaag attactttga gaaatttggt ggaatttatg
7321 atgtgctgt gaagaagctt aatgaattat attctttaaa atctatgaa ggttttaaca
7381 aattccttga catgttgata aagaaattaa agtcaattga atgacactca ttttgatgt
7441 aaaccaatga caaaatccgt gagggtgact agagactcaa tgggtgactg caggctctg
7501 aactacacca aaaagctgaa gcatataaac tgtttttaga ggaacccaag gccacagttg
7561 cagtgatctc ggaagcccta caggacacca aataacactt atatcaactt tggttacag
7621 aggtcttaag ttcagcatct ttggctcaca tgaaggccaa atctccagag actctagaag
7681 atacacaga ccgaattgat caaatggaca ttcagcagga actccaagca tactgtctc
7741 tggtaggcca ggtttatagc acacttgtca cctacattt tgatgtgtg actcttgtct
7801 ctaagaaacct lacagacttl cgagagcaal atclatcca agatgtggct aaacgatga
7861 aagcattgtt agagcaaggg ttactgttcc ctgaaatcaa gacctctctt gggacatgc
7921 ctgccttga agtgcagctt caggctcttc agaaagctac ctccagaca

7981 tagtccccct aacagatttg aggatcccat cagttcagat aaacttcaaa gacttaaaaa
 8041 atataaaaaat cccatccagg ttttccacac cagaattttac catctttaac acccttccaa
 8101 ttctcttcctt tacaattgac ttgtgcgaaa tgaaagttaa gatctcaga accattggaag
 8161 agatgcagaaa cagtgcgtcg cagtggcccg ttccagatata atatctcagg gatctggaag
 8221 tggaggacat tctcttagcg agaattcacc tgccagactt ccgtttacca gaaatcgcaa
 8281 ttccagaatt cataatccca actctcaacc ttaagtattt tcaagttctct gaccttcaaa
 8341 taccagaatt ccagcttccc cacatctcac acacaaattga agtacctact ttgtcgaagc
 8401 taticagatt tctgaaaact caatctcctc ttctcacatt agatgcgaat cgtgcacatg
 8461 ggaattggaac caccctcagca aacgaagcag gtatcgagc ttccatcact gccaaaggag
 8521 ttcccaaaatt agaagttctc aatttttgatt tccaagcaaa tgcacaactc tcaaaactga
 8581 agattaatcc gctggctctg aaggagtcag tgaagtctct cagcaagtcg ctgagaacgg
 8641 agcatgggag tgaaatgctg ttttttggaa atgctattga gggaaaaatca aacacagttg
 8701 caagtttaca cacagaaaaa aatacacctg agcttagtaa tggagtgatt gtccaaatga
 8761 acaactcagct taccctggat agcaaacata aatacttcca caaattgaaac atcccaaaac
 8821 tggactttct tagtcaggct gacctgcgca acgagatcaa gacactgttg aaagctggcc
 8881 acatagcatg gacttcttct ggaaaagggt catggaaatg ggctgcctcc agtacttcag
 8941 atgagggaaa acatgaatca caaattagtt tcaccataga aggacccctc acttctcttg
 9001 gactgtccaa taagatcaat agcaaacacc taagagtaaa ccaaaactgt gtttatgaat
 9061 ctgctctccct caacttttct aaacttgaaa ttaaatcaca agtcgattcc cagcagtttg
 9121 gccacagtg tctaaactgct aaaggcattg cactgtttgg agaagggagc gcagagttta
 9181 ctggaggagca tgatgctcat ttaaatggaa aggttatagg aactttgaaa aattctcttt
 9241 tcttttcagc ccagccattt gagatcaggg catccacaaa caatgaaagg aattggaag
 9301 ttctgttttcc attaaagttt acagggaaga tagacttctt gaataactat gcactgtttc
 9361 tgaagtcagg tgcccagcaa gcaagttggc aaglaagtgc taggttcaat cagtaaaagt
 9421 acaacaaaaa ttctctgctt tctcttaaac ttgctttaa acactctgaa atgtgctctac
 9481 atcagcagat aatctgggat tctcttaaac ttgctttaa acactctgaa atgtgctctac
 9541 ctacacaaat aatcacaact cctccactga aagattttct tctatgggaa aaacacggct
 9601 tgaaggaaat cttgaaaacg acaaaagcaat ctcttgattt aagtgtaaaa gctcagtata
 9661 agaaaacaaa acacaggcat tccatcacia atcctttggc tgtgctttgt gaggttatca
 9721 tgcagagcat caaatctttt gacagcgatt ttgaaaaaaa cagaaaacaa ctagtagatt
 9781 ttgtcaccaa atctcataat gaaacaaaaa ttaagtttga taagtacaaa gctgcaaaat
 9841 ctccagcaga gctccccagg acctttcaaa ttctggata cactgttcca gttgctcaatg
 9901 ttgaagtcag tccattcacc atagagatgt cggcattcgg ctatgtgttc caaaaagcag
 9961 tgcagatgcc tagt ttctcc ctagctgggt ctgacgtccg tgtgcttcca tacacattaa
 10021 tctctgccat attagagctg ccagtccttc atgtccctag aaacttcaag ctttctcttc
 10081 cacttttcaa ggaattgtgt accataagcc atatttttat tctctgccat ggcaatatta
 10141 cctatgattt ctcctttaaa tcaagtgcca tccactgaa taccaatgct gaacttttta
 10201 accagtcaga tattgttct catctctttt ctctatcttc atctgtcatt gatgcactgc
 10261 agtacaattt agagggcacc acaagattga caagaaaaag gggattgaa gttagccagc
 10321 ctctgtctct gagcaacaaa ttgtgtggag gtatgcataa cagtactgtg agcttaacca
 10381 cgaaaaatat ggaagtgtca gtggcaaaaa ccaaaaaagc cgaaattcca attttgaa
 10441 tgaattttcaa gcaagaactt aatggaaaaa caaagtcaaa acctactgtc tcttctcca
 10501 tggaaatttaa gtatgatttc aattcttcaa tgcctacttc taccgctaaa gtagcagttg
 10561 accacaagct tagcttgaaa agcctcactt ctacttttct catgtagcca tctaccaagg
 10621 gagatgtcaa gggctcggtt ctctctcggg aatatctcagg aactattgtc agtgagacca
 10681 acacttactt gaattccagg agcacacggt ctctcagtgaa gctgcagggc acttccaaa
 10741 ttgatgatat ctggaacctt gaagtaaaag aaaattttgc tggagaagcc acactccaac
 10801 gcatatatcc cctctgggag cacagtacga aaaaaccactt acagctagag ggcctctttt
 10861 tcaccaacgg agaacatata agcaaaagcca cctctggaact ctctccatgc caaattgtcag
 10921 ctctgttcca gttccatgca agtcagcca gttctctcca gatttccctt gaccttgccg
 10981 aggaagtggc cctgaatgct aacactaaga acagagaagt cagatggaaa aatgaagtcc
 11041 ggaattcatc ttgggtcttc cagagccagg tcgagatgaa caatgaccaa gaaaagccac
 11101 accttgacat tgcaggatcc ttgaaaggac acctaaagtt cctcaaaaat atcatcctac
 11161 cagtctatga caagagctta tgggatttcc ttaagctgga ttaaacctga agcatgtgta
 11221 ggagacatca tcttctgtgt tcaactgctt ttgtgtacac caaaaaaccc atgaggtact
 11281 catctcccat cctgttaaaa gttttggctg ataaatctac taactctggg cttcaacata
 11341 atgatctaaa ttcaagtctt gtcactgcta cgttccatgt cctatctaga gatctcagg
 11401 ttccatcgct caaacattgac ttcagagaaa ttcagaaacta taagaagctga gaactctga
 11461 caatttgcct caacctacca acactcccc aggttaaaat cctgaagttt gatgtgttaa
 11521 caaaatattc tcaaccagaa gactctctga ttcccttttt ttcccttttt ttccagataacc
 11581 ctcaagttaac tgtgtccagg ttcaagcttc caaaaaggtt ttcaagatagc attgtcgtct
 11641 tggatctaaa tgcagtagcc acaagaatag gactcttga gtttccctgc gttgcgccac
 11701 ctgagcagac cattgagatt ccttccatta agttctctgt acctgtgga cctctgtgga
 11761 tctcttcca agcaactgact gcaagctttg aggtagactc tccctgttat aatgccactt

```

11821 ggagtgccag tttgaaaac aaagcagatt atgttgaaac agtctggat tccacatgca
11881 gctcaaccgt acagttccta gaatatgaac ggaacacac aaactcgaag
11941 atgttgactgt agcctctaag actaaaggaa cacttgcaca ccgtgcactc agtgcagaat
12001 atgagaaga tggcaaat ttt gaaggacttc aggaagaacg ccaccttaata
12061 tcaaaagccc agcgttcacc gatctccatc tgcgctacca gaagacaag aaagcatct
12121 ccactctcagc agcctcccca gccgtaggca ccgtgggcat ggatctggat gaagatgaag
12181 acttttctaa atggaacttc tactacagcc ctgagtcctc tccagataaa aaactcacca
12241 tattcaaaa tgaagttgag gtccgggaat ctgatgagga aactcacatc aaagttaatt
12301 gggagaaga ggcagcttct ggcttgcata cctctctgaa agacaacgtg cccaaggcca
12361 cagggttctt ttatgattat gtcaacaagt accactggga acacacaggg ctacccttga
12421 gagaagtgct tcaaaagctg agaagaatc tgcagaaaca tgctgagtg ggtttatcaag
12481 gggccattag gcaaattgat gatctcgacg tgaggttcca gaagcagcc agtggcacca
12541 ctgggacctt ccaagagtgg aaggacaagg ccgagaaact gtaccaggaa ctgttgactc
12601 aggaaggcca agccagtttc cagggactca aggataacgt gtttgatggc ttgttgacag
12661 ttactcaaaa attccatgat aaagtcaagc atctgattga ctactcatt gattttctga
12721 acttcccagc attccagttt ccggggaaac ctgggatata cactaggggc gaactttgca
12781 ctatgttcat aaggagggtt gggacggtac tgtcccaggt atattcgaag gtccataatg
12841 gttcagaaat actgttttcc tatttccaag acctagtgat tacacttctc ttcgagttaa
12901 ggaacataaa ectaatagat gtaattctga tgtataggga actgttgaaa gatttatcaa
12961 aagaagccca agaggatttt aaagccactc agtctctcaa gaccacagag gtgctacgta
13021 atcttcagga ccttttcaaa ttcatatttc aactaaataga agataacatt aaacagctga
13081 aaggatgaa atttacttat cttaataatt atatccaaga tgagatcaac acactcttca
13141 atgatattat cccatattgt tttaaatgtt tgaagaaaaa cctatgcctt aatcttcaat
13201 agttcaatga atttattcaa aacgagcttc aggaagcttc aggaagcttc cactgacatc
13261 atcaatcatc tatggccctt cgtgaagaat attttgatcc aagtatagtt ggctggagac
13321 tgaatatatta tgaacttgaa gaaaagatag tcaagttgat ccaagacgtg ttagtgtctc
13381 ttaaggactt ccaattctga tatattgtca gtgcctctaa ctttactctc caactctcaa
13441 gtcaagtttg gcaatttctg cacagaaata ttcaggaata tcttagcttc attccagatc
13501 cagatggaaa agggaaaag agaatgtcag agctttttgc cactgtcagc gaaataatata
13561 aaagccaggg cattgcgacg aagaaaaata tttctgatta ccaccagagc tttagatata
13621 aaactcgaag tttttcagac caactctctg attactatga aaaaatttat gctgatacca
13681 aaagattgat tgacctgtcc attcaaaact tctgatatac ataccaggtt gctccaggag
13741 tactgaaaaa gctgcaatca accacagtc tgaaccccta catgaagctt gctccaggag
13801 aacttaactat catctctcaa ttttttaaaa gaaattctca ttattctctc ttttccaaat
13861 gaactttcac atagcacaga aaaaattcaa actgcctata ttgataaaac catcagtgta
13921 ctcagccttg cagtaggcag tagactataa gcagaagcac atatgaactg gacctgcacc
13981 aaagctggca ccagggtctg gaaggtctct gaactcagaa gggatggcat ttttgcaagt
14041 taaagaaaat caggatctga gttattttgc taaactggg ggaggaggaa caaataaagt
14101 gagtctttat tgtgtatcat a

```

IL1RL2 cDNA sequence (SEQ ID NO: 9)

NM_003854 Homo sapiens interleukin 1 receptor-like 2 (IL1RL2), mRNA.

```

1 cccgccacg gtgcgggga aatacctagg catggaagt gcatgacagg gctcgtgtcc
61 ctgtcataatt ttccactctc cccaggtgac tgcgcgcttc aatcctgacg gcagcccggt
121 ttggggatgt ggtccttgct gctctcgagg ttgtccatcg cccttccact gctgtcacaa
181 goagatggt gcaaggacat ttttatgaaa aatgagatgc tttagcagac ccagcctttt
241 gcttttaatt gtacattccc tcccataaca tctggggaa gtcagttaac atgagataaa
301 aatctacgca aaatccaggt gtccaaaatc atacagctca gaattcacca gacggagact
361 tggatttttg ttctcccat ggaatggggg gactcaggag tctaccaagt tgttataaag
421 ggtagagaca gctgtcatag aatacatgta aaactaacgt tttttgaaa acatgtgtgt
481 gacacttcca taggtgggtt accaaaatta tcatagtagt acaagcaaat attacactct
541 gaaaagatga atagtctcac atgtcatctg cacttccagg agagtttgtt ttgtggtcca
601 ataaagtggt ataaggactg taacagagat aaaggggagc ggttccactg tttggaaacc
661 aggtcttttg tgagcaatgt ctccgacag gacagaggga actacgcgtg tcaagcaata
721 ctgacacact cagggaagca gtacagaggt ttaaatggca tctactgtgag catcacagaa
781 agagctggat atggaggaa gtgtccctaa atcattttac caaaaataca ttcaattgaa
841 gtacagcttg gtaccactct gattgtggac tgaatgttaa cagacaccaa ggaataatca
901 aatctacagt gctggagagt caataaacct ttgttgagat atactatga tgaatacaaa

```



```

961 cgaatcagag aaggggtgga aacccatgtc tcttttcggg aacataattt gtacacagta
1021 aacatcacct tcttggaggt gaaataggaa gattatggcc ttcccttcat gtgccacgct
1081 ggagtggtcca cagcatcacat tatattacag ctcccagctc cggatttttcq agcttaacttg
1141 ataggagggc ttatcgccctt ggtggctgtg gctgtgtctg ttgtgtacat tacaacattt
1201 tttaaagatgc acattgttct ttggatcga agtgcccttc attctacaga gaccatagta
1261 gatgggaagc tqtatgacgc ctatgtctta taccocaaag ccacaagga aagccagagg
1321 catgcccgtg atgcccctgt gttgaatrac ctgcccaggg tgttggagag acaatgtgga
1381 tataagttgt ttatattcgg cagaatgaa ttccctggac aagccgtgac caatgtcatc
1441 gatgaaaacg ttaagcgtgt caggaggctg atgtcatgt ttgtcccaga atcgctgggc
1501 ttttgccctgt tgaagaacct gtcaagaaga aaaaatcgcg tctacagctg ctgatccag
1561 gacgggatga aggttattct cattgaagct gagaaaaatc aggaactaac agtcatgcca
1621 gagtcaattc agtcatatcaa acagaagcat ggtgccatcc ggtggcatgg ggaactcacg
1681 gagcagtcac agtgatgaa gaccaagttt tgggaagacg tgagatacca catgcccgcc
1741 agaaggtgtc ggccgtttcc tccggtccag ctgctgcaag acacaccttg ctaccgcacc
1801 cgaggccccc aactaggctc aagaagaag aagtgtaact tcacgactgg ctaagacttg
1861 ctggactgac acctatgctt ggaagatgac ttgttttctt ccatgtctcc tcattctcac
1921 acctattttc tgcgtcagga tgaggctagg gttagcattc taga

```

WASPIP cDNA sequence (SEQ ID NO: 10)

NM_003387 Homo sapiens Wiskott-Aldrich syndrome protein interacting protein (WASPIP), mRNA

```

1 tagaagacag caggggaact cgagaagttg gttgttttca gcagattaaa acaatcacaga
61 ttatcacga cagactgttg acgcataact gcccaagatg cctgtccctc cccctccagc
121 acccccgcg cccccgagct ttgcactggc caatacagag aagcctaacct tgaataagac
181 agcagcagct gggagaatg ctctcctttc tgatatcagc aagggagaga aactaaagaa
241 gacggtcacc aatgacagaa gtgcaccaat actgagacaaa cctaaggagg ctggtgctgt
301 aggcqglgt gtgagctttg gtggaggcgg cgaatttgac gaggagagtg gtggcggaag
361 cggtaggaat tttggagggg gcggaacctc aggtctggga ggattgtccc aggcctgaat
421 gccgaagctg agatccacgg ccaacaggga taatgatfcl ggagggaagc gaccacatt
481 gttgccacgc ggaggaagat ccacatctgc gaaacctctt tcacccccaa gtggcccagg
541 gaggttttct gtgcttctc caggccacag aagtggtccc ccagagcctc agaggaacgc
601 aatgcccgcc ccaaggccgc acgtgggctc aaagcctgat agcatctctc ctccagtaac
661 tagtactcca agaccattc aatcaagctc gcacaaacgg ggttccccac caagtcccgc
721 agggcccagg cagcccagcc cggggccacc tctcccccct ttccctggaa accggcgacc
781 tgctttggga ggaggctcaa tacgtcagtc ccccttgagc tctctctcga ccttctcaa
841 ccgctctccc ctgccccta ccccagcag ggctttgat gaacaaaccc ctccaccacc
901 tctccagtg ggcaacaggc cctccatcca cagggaagcg gttcccctcc ctctctcaa
961 gaacaaacag cctccagtc ctccactccc gcccctctcg cctctccac agggcccacc
1021 tccgcgcgca cctcccagca gcccggggcc gctcctctg cctccagat ctacggcgaa
1081 tgacgaaacg ccaagactcc cacagcgaaa tctgtccctc agttctgcca cgcgccgctt
1141 acctctgcca ggacgttcag gtctctcttc tccccgcccc agtgagagac ccccactctc
1201 agtgaggagc ccgcccagcc gatcaggccc cctcccacca cctctccag taagcagaaa
1261 cggcagcaca tctcgggccc tgctctgctc cctcagtg ccattccagg gtggagtaga
1321 cagtcccagg agtgagccca ggctccctct tctcctgat agggccagtg ctggggcacc
1381 tccccacact caccatcaa catctattag aaatggcttc caagactctc catgtgaaga
1441 tgagtgggaa agcagattct acttccatcc gatttccgat ttgccacctc cagagccata
1501 tgtacaaacg accaaaagtt atcccagcaa actggcaaga aacgaaagcc cagatgtgatc
1561 caaccagaag gaaaggggtg ctccaccact cctcccacac ccgagtgat ctttgctctg
1621 tctctctcac ccaagctcaa gagctgcttc tgtgtctatc taagaaagaa atacctctc
1681 cctgtctctt tccctgtgct ctcagtatg ggcaggagga aagtgaggag gggagtggtg
1741 aatatgctgt tgggggtggg aatcggttaag aatgcacct agcttttcat attgtttta
1801 tctccaggc tattgtctgc ttacgtgca gctgcctgt gctggctctg ggggtgcat
1861 gctctttgtc tgaataggca gagatgactt gctccacagc ttccaccata ccaaatcaa
1921 acattcactg cttatttgtt acagactgta attattaaag tccctgagag ctgttttctc
1981 cgtgtctctt tctgcatgct tggcctctc tctgtttcta tgaacacagc accacctaa
2041 caagctgctg agtaagggct cactggaaac ttacagctac aggatgtcca atctttggca
2101 gtccagactt ggctctagga cagagctgtc cttcagataa ataatgtatc cccatatac
2161 aatttttaca tttctaata atttttaaaca agtgaagtta atatgcatcc aaaaatttct
2221 aacctgaatg caacataaaa ttttaattga atattttata gtaactgaatc

```

```

2281 ttcaaaatcc agagtgtatt ttacacttac cgcacatctc cactcagact agtcacattt
2291 ttaagtgtct agtagccaca tgtggctggg ggctactgga ttgagacaga cgaagtctga
2401 agatgggaag tagtcgagaa acctctgttt taaaaaccaa aaaagccaag atgggcttga
2461 gcgactccaag aggcaactaa aataaaattt agaccacca acctctgttt acacacagtt
2521 tgaccttcca ttctctccc ttaactcccc tcttccctta atacttgtat acaagttgtg
2581 ctccaagata ccaaggtcag aaattgattc agtacggctt actaaagta tbtggaataa
2641 agcatttgga acaaaatgga aagcctctgc ggactctgg gctcagaacc agctggctta
2701 cgcactccac ttgtcagctg gactctcgcc ttgtgaaatt gaaqcaagct ttgtcccttt
2761 ctggctgagc aagctcctga ggctgggaga gactaggaag cgtctgttgg aggggaaaaa
2821 agtcaggaaa agatatcaaa tcagaaacat ggaagaccga ttgagttggt
2881 ggccaaaact ctaaaaatct aaactctgat ctattgtaag gggtgagcga attagggaga
2941 ttgttagtgg aaattggagg gaattgtgtt tgcattcatt gtctaggatc ttccagaata
3001 tagctccact aaaggaccaa agggaaagag cagccttgcc ttctcttata tgattttggt
3061 taaaaaattt tactgggact tttaaatcta gctatagagt tgggaaaaaa tatttccact
3121 tagatttttt acatgggttt gtttaaaatt accattactt gttttttaa aacacatgac
3181 cacatatgta tatgtatac tacctaaaca ttgtatcatg gtttcagtat gttattctatg
3241 tattactggg agatgctacc aagaaaccaa cccaagaaa atcttgaaa atacatttct
3301 atttatgaaa taaatgtttc atttatataa aagcaaaaaa acctagagtt ctaataaagt
3361 ggaatgctaa taaattatga agttactgat ttgaatatat tatattttta taacttctct
3421 gccaaagtcc tgaattagta cattagagaa cctgtgtttc ctctctccc tccattctcat
3481 ctctcttcca tacagtcatt tgggcttttt actcaagag aatcaagaaa taataaggta
3541 taacaagctt ggcaaaagtg tggcttttta aaaaaaaatt ttttatact ctccagttgt
3601 ggtaatttag caqcatcatt tatttgggat tcttttatct gatttcaaca gtgaaaaaaa
3661 tcctctatga aaagcctaag gaccatttcc acaaaagatg gaatttggcc ttactgaataa
3721 atatgacgga gaaaagctcg actcagagaa agtgagctcg aattttataa ggggtagtta
3781 gaattggaca attcctttgc atatctgaac ttggcagta ccgtttctaa tctgaacacg
3841 ggtgtagagt caaagtgccc attcatccag aatagattgt tttagaagt agtgttttaag
3901 tgactgtttc attaatcac ctacacctt ttgtgaaag ttgtcaactc aattgcatct
3961 aaaaactata ataatgtctg tggtaaaatc ttaactatg gaaaaatca aaaaatgaat
4021 ttcttctccc gaaatcagag ctacacatgt ttgtttttta taacttttc agataaatgt
4081 attcaacatg taatacagta tttaaacatt ccactcttat tttaattga aatgttatatc
4141 agtattaaaa ctcagtgctc agtatattat tcaacttcta tttaattga taaaagcagc
4201 gagaaatggt taatccaatg gtgccttact ttgtgattta aaagaaatca actttttttt
4261 atgtctaagt agtagattat ttgcatattt gtaaaaactg ttagctcttt atttttataa
4321 gtgtaatacc agttttgtta ttttagtagc agaaaaggga tgattgttaa agttccccaa
4381 aaatgtttgc atgaatttaa ttttccctc ctatagtcga aggaccgtga aggaagaaaa
4441 actttttttt cataccatgc actatgtaaa cagacacatt ttgctatctg tgtcatcagg
4501 atagtgtaag tggtagggta gagactcccc tagacatctg catctttaga agttagccag
4561 acaataaaga aaagcgaat gaaaaaaaaa aaaaaaaa aaaa

```

BVES cDNA sequence 1 (SEQ ID NO: 11)

NM_007073 Homo sapiens blood vessel epicardial substance (BVES), transcript variant A, mRNA

```

1 tcaggcagcc ccagcgctccc cgggcccctcg gccccaccga gtgcgggctc ccgcgctctg
61 cggcggaagc ccccttgga aacttataca gactcagccc catttgagaga
121 atcaactgcc ataggtttta cactgagttt agaaagatgc atacctgtgc cttccaataa
181 gaccacttgt gaaaactgga gagagataca tcatctgtag ttcatgtgat caaatatttg
241 ttttgcagtt gggttgggta ttcaactaac tcttcaacct catatgatat tctttagggg
301 aatgttaact cttagatgta ccttttatac cgtctgggac actctctacc agtggtgctt
361 ggatataatg atctggaact ctgtgttctt ggggtgcaac attttgcatc tgtcgtatct
421 ttatatacag aagagaccgg taaagattga aaaggaaact agtggcatgc accggcgatt
481 gtttggaacca ctccgtgtgc ctccagattt gttcagaaga ctaactggaac agttttgcat
541 gatccaaacc ttgaaaaagg gccaaactta gctcgaagga gataaaacct cagttgatga
601 ccgtctgagt attctcttga agggaaaaaa gaaggtctcc tatcgaggac attttctgca
661 taacatttac cctgtgcct ttatagattc ttatagattc agatgataac tgcagatttt tatgtcgttc
721 aggtgaaaaa ttccaggtcca ccatatttgc agatgataac tgcagatttt ttgtatgaaa
781 aagagaagaa ttaacatact ttctggaact agaacccttc ttgtatgaaa ccttataagta
841 tcttatgga aagaacatca caaataagct ctactcattg aatgatccca ccttataagta
901 taaaaaagcc aaaaagctcg aacatcagct cagcctctgc acacagatct cactgttga

```

```

961 aatgagggaac agtatagcca gctccagtgga cagtgcagcac ggcctgcacc agttttctcg
1021 gggtaacctcc agcatgtcct ctcttcattgt gtcattcccca caccagcgag cctctgccc
1081 gatgaaccg atagaagaag gagcagaaga tgatgatgac gtttttgacc cggtctctcc
1141 aaatcacattg aagaaccatc agctgccttg atcagagaga gaattccagc taccagagcg
1201 gaaggtgtct tgaagagatc ctgaaaaata ccagcacctt ttcattgccc ttagggtatt
1261 ctgcttttagt gctccagcac tgggtggagtc ggagggagga agtgaggaag ggtcaaggat
1321 ggaagagtct tttcacttac ccttttttatt agtcagcttt taaagttaatt gttttactga
1381 gctctctgac tatgctctgt tctcttttga gatataattt ttccagctgt ttccatagata
1441 tatatttgtt ttaacttaac aaatctttagc aaatcttcaa tgcctttcca ctattttttt
1501 tccaagttat gattttttt cctcacagtc ttttttgttc ctatgacaa aggtgtgtcca
1561 ttgtataatt ttaacaaaca atgtaagttt aaaattgagg ctaaggtaac atgaaaaagc
1621 aggggaattc aaactttat

```

BVES cDNA sequence 2 (SEQ ID NO: 12)

NM_147147 Homo sapiens blood vessel epicardial substance (BVES), transcript variant B, mRNA

```

1 agagcgccga tggctgggga cccgaggtcc gcgccacca cccgcaacct ccttccccga
61 gcttttggga acgggtgtgt ggccagacaa gtcccagaaa ctgccttcgt tgaagcatga
121 ataagtgcga aaagactctt agcaatgaat ttcaaaatg aattatcacag agtccagccc
181 attgagagaa tcaactgcga taggttttac acctgagtta gaaagtatca taacctgtcc
241 ttccaataag accacttgtg aaaaactggag agagatacat catctggttt ttcatgtagc
301 aaatattgtt ttgtcagttg ggttgggttat tccaactact ctccaacttc atatgatatt
361 tcttagggga atgttaactc taggatgtac cctttatatc gtctgggcca ctctctaccg
421 atgtgccttg gatataatga tctggaactc tgtgttcttg ggtgtcaaca ttttgcatct
481 gtctgtatct ttatacaaga agagacgggt aaagattgaa aaggaactca ttggcatgta
541 cggcgcatgt ttgaaaccac tccgtgtgcc tccagatttg ttcagaagac taactggaca
601 gttttgcatt atccaaacct tgaaaaaggg ccaaaactat gctgcagagg ataaaacctc
661 agttgatgac cgtctgagta ttctcttgaa gggaaaaaat aaggctctct atcgaggaca
721 ttttctcat aacattttac cctgtgcctt talagatttc cctgaattta gatacaactc
781 gatgcacaaa ggtgaaaaat tccaggtcac cattattgca gatgataact gcagattttt
841 atgtcgtgtc agagaaagat taacataact tctggaatca gaacctttct tgtatgaat
901 ctttaggat ctatttggaa aagacatcac aataagctc tactcattga atgatccca
961 cttaaatgat aaaaaagcca aaaagctgga acatcagctc agctcttcca cacagacttc
1021 catgttggaa atgaggaaca gtatagccag ctccagtgac agtgacgagc gcttgaccca
1081 gtttcttcgg ggtacctcca gcatgtcttc tctcatgtg tcatccccac accagcgagc
1141 ctctgccaa atgaaaaccga tagaagaagg agcagaagat gatgatgacg tttttgaacc
1201 ggcattctcca aatcatttga aagctcatca agtgccttga tccagagagc aattcaggtt
1261 accaagagcg aaggtgtctt gaagagatcc tgaaaaaata cagcaccttt tcatgtgctt
1321 taggttattc tgccttagtg catccagact ggtggagtcg gagggaaggaa ggtgaggaag
1381 gtcaaggatg gaagagttct ttaacttacc ctctttatta gtacgtcttt aaagttaatt
1441 ttttactgag cctcttgact atgctctgtt ctctttttag atatatattt tccagctcaa
1501 aaaaaaaaaa aaaa

```

PELI2 cDNA SEQUENCE (SEQ ID NO: 13)

NM_021255 Homo sapiens pellino homolog 2 (Drosophila) (PELI2), mRNA

```

1 cagccacgac ggagcagcag cgggactggc cgcgccgcgc ccccttcgcc gcctgtccct
61 tccccgcgcg gctcaccocg ttctcgggat gggatttgtag cggcgccgcg gactcggcgg
121 ggatcgcgcg ggagcgcgcg gcgtcggcgc cggcgttcgag ggcgcagcgg ggtctccatgt
181 ttctccctgg ccaggagga aactgcgcgc ccaataaggga gccagtgaaa tacggygagc
241 tgggtgggtc cgggtacaat ggtgctttac ccaatggaga tagagagcgg aggaaaagt
301 gatttgcctt ctacaagcgg cccaaggcaa atggtgtcaa cccagcagcc gtccatgtga
361 tatccacgcc ccaggcatcc aaggctatca gctgcaagg tcaaacagat atactctaca
421 ctttgcgaag gaatcagact gtggtggttg agtacacaca gctgcaagg atcgatattg
481 ttcaaggtggc cagatcaaca gaagacccta tcgacttcgt tctcagagac atcgatttctg
541 gcagccagaa caggacgaa gccagatca cacagagcac catatccagg ttctcgtgca

```

601 ggatcggtgt cgacaggaat gaacctttaca cagcacggat attcgccgcc ggaatttgaact
661 cttccaaaaa catatttttt gggagaaaagg cagcaaaagc gaaaaacccc gaagggcaca
721 tggatggggt cactactaat ggcgtcctgtg tgatgcattcc acgagggggc ttaccggagg
781 agtcccaggc cggggctctgg ccgagagatct ctgtctgttg agatgttatc acctgtcgag
841 aaaccagggt ggcccagcaa cgagggaaaag ttgtggaaaag tgagaccaac gtccrccagg
901 acggtccccc catgacctg tgtggggcca ctctcctctg gagaaccaac gagggtcttt
961 ttcatactcc aactcagaag cacatagaag cctcccggca ggagatlaac gccgcgcggc
1021 ctacagtgttc ttgggggctc aacacctggc ccttcccag catcaaacag aaagaggtgg
1081 tggagggagaa gcagccctgg gcatactcca gttgtggcca cgtgcacggg taccacaact
1141 gggggcatcg gagtacacg gaggccaagc agagggagtg tcccatgttg aggactgtgg
1201 gcccctatgt gcctctctgg cttgggtgtg aggcaggatt ttatgtagac gaagggccgc
1261 caactcatcg ttctactccc tgtggacacg tgtgtcgga gaagtctgca aataactggt
1321 ctacagatccc gttgcctcat ggaactcatg catttcacgc tgcttgcctc ttctgtgcta
1381 cacagctggt tggggagcaa aactgcatac aattaatttt ccaaggtcca agactctgac
1441 gcccttgaca gccatctacg accttattaa caggttactg tgaagatttt gccactaact
1501 ctagatttta cctttttgta atgctgttta tcagaggagg gtgacagggg ctggaataat
1561 agagagggga catggtgatg aaacatggca ggagtgtaac agataccagt ggtgtgttgc
1621 atgctcaaaa cagcagcgtc gtcattgaag tctgcttgat ccaaccataa tatctttgta
1681 ataatgggat ttaaaatgct atgcttctat tttaaccctt ggggttttaa ccaagttttt
1741 tttttttttt gtaactcttg acaagacttt aaatcatatt ttacagatgt agaggaattt
1801 tattcaaaag tgtgggtcca tgaagtctac ttccagtcag ttgtgtgtag gtgttccagg
1861 aagggccgac agtgcctaga aatacttgat cgtggctgac acctgaccag acagcagagg
1921 ggcggctctg tacagtgta cttgtggaca gttggcctta ggccagagtg gttttgaaat
1981 ctggagcttt ttctgattta tttttctgac gatgtgagat agagaatat ctaactttgt
2041 gggctttttt ttttttaac ttacgtggaa ttacttttag atatctattc atcaaatata
2101 tggagactcca caacaatttt tccaacttt tttagcctgt cttttgttat ttctgctcaa
2161 tatgatttgc cccgatactc atcttgcacg gccagaactg ttgtgttgat taaataatc
2221 cagctcttaa aaactcatta actgaggta attacagtag tagacatgt ctgggtacta
2281 tactaccagt ttattttgct gactgaatta agatttaaga atgattaaaa ataaagcttt
2341 actttttaaa accacttgag gtttcataaa gtttggggtt ttttttttct cttgttttaag
2401 aaagcaacc aatcacaatg atatagtcac tgtgtgtcac tcccttttca ccatctgta
2461 ccttcccttg cagcttaagg agcccagtaa gttttgaaaa tgtttgcga tttaacttaa
2521 ttttaagtggt atgattagat atacacaaca ccaagtggtta catctgcaga gataattcaa
2581 aattctcgct ttgagagag caaatgagt ttgtctgagg aataattaaa tggagaattc
2641 ataggagctc caccattctc gttactttca ttcattttg attaataatt cttggatgct
2701 tggcatcgat cgtatcactg ctccatagaag gtaaaagtcc tttaggagat gagactggta
2761 gaagctggct gagaataaat aagattttat taaactaat gtctcttata tttagcatt
2821 gcaagatttg gtagcttttt tttaaccttt gtaatatatc gtaattttaa tgaattctaat
2881 gtaactatct cataactgaa ttggtttttt cgtattttgc ctactggcaa atattttgcc
2941 tattttcagt cgttctaacc taattgaata gccttttctc taaagtata cgaataatt
3001 actcttgatt gctgctgctt aatttgatgt aatattgtta aagtctagcc tctcagtttt
3061 aataagctct tatttttcag tggagatcat ttgttaggat gagactattt tggttttggt
3121 ttgttttggt taaattttaa atggtgtgaa aatcgatgac aacagctccc tttacagatag
3181 ctgtctgtat tctgtatagc ttactctacc tcagacaga aatgaaaga aaaaaattga
3241 ctgctctaga ataataatt ttactctctg taattttagc agagctgct atgtatagct
3301 ttgctctgata gagtatgct tttaagcctt taactctttg ggccccaag atgacaaaag
3361 gaggcactgc ttcttttttc ttgctgtatg cctgaaaagt ggttgaaagg ttctgtgatg
3421 ccttaaaacca cttgttaagc taaatggctg tgatccaaga aaggccagat tttaacctac
3481 aagaaaaaaa gatatttttc cagagagtta ggtatatcat aattttccat ttcaagctct
3541 gtttataagt ctagtcatc tgcaacgtga catatcccc catatccccc gataattcca
3601 gttggacagc tccgtatgtt gggcatatgt ctaactaaaag gttcttgact tttagtaaat
3661 tcaactttaa tataagttga aatttgggaa aatttccca ataattttga aggggttaaca
3721 gtaacccgct cctcatgggc tccacatctt ttccctttgpc ttcocaaagt aggtcccgcg
3781 cactctgcct aaggaaactgc agagaggtgg ccaatcagca aaaaagacac caggtctctc
3841 ttgccaactc taggaagat ccttttcaaa ttgtgactaa ggagattttt tttttcacag
3901 ttgagttagt ttgtgaaat aagaactctc gtgactcaac aaggtggaga aacgcaatc
3961 agaaaaat ttttccaag gtttcccaag ttattatgct ttgcactaac tttaaggagc
4021 tagcccactc ccccatgtg tatacacaag gaaatttgag accaatagt tgtctgggc
4081 tgaacttaat gccttttgca agtagctttc cagaagtaaa agtccagtg atgtattccc
4141 atagaaatat ttctcagt tttagtctgt ttactacaaa aaaaagagtt cagagtggtat
4201 ggaagtcaac ttctgatttt ttcttagtcc ggaatttttt attaataatc ggtgtgcgct
4261 ggtcatgcac ctgcacactc tcaacatttc ccttatgttg ttcttccca cgtgtggcc
4321 gctacagttc acctgcaga gatttaagtg ttctggattt ttatcttccc actgtggcc
4381 aaaaqaatta aaatctgtta atataaatag atataaatat tttatctctc cagatgttaa

```

4441 ttatagacct tggtagcttt gtgcctcagg gaagccacgt gatataactg gttatagaat
4501 ttcagggtta ggggttaaag aaaggagaaa gccattggaa aatgatgggg ctccattaa
4561 gagcactaat aatctggatg cagaaatagt tcagaaactg gcataaacat gattgtagta
4621 gaattlatlt tccagtacca atagggaat tattttaagt tattacaatt actgtatttg
4681 gaaacttgag gagaactctt tagttcataa agcttcaatg tctttttttt ttttttttct
4741 ggaataactc aaactctgtg tatttgggag ctcagatttg ctggacactc tacgagagtt
4801 ttctctctaa ttgaagtgtg atataagggt tagaattgtt accgtcagtt ctatggtttt
4861 gtttctactc ttctcttttt taaagccatt ctgttctgtg gattgtcttg taagggtgtg
4921 tgaatcacac atgtttaatg ctgggtaaaa actatctctt tgcagccttg cctcataaca
4981 gtggaatttc tgatagacaa accacaggac ttgtatttta agccaaatcc atctccatc
5041 ctttactgtc aatctctgtg cccagtagtt tagcctttgt ggcttaggtt atgatgcgac
5101 tcttctgtgt cgaccaatga gacgacttca gcactctttt aaaaataact aagcatcatt
5161 gaagcagtaa caaaaaaa aggttcaagta ttttcttttt agtataactc acatccttcc
5221 aaataagttc ttgccctcat gaagaatccc tagaggaaga taaggaaaaat aagttatttc
5281 cagttttgct tgacagtttc taaacaaaca aaaataaact caatgaaggg aagatgtgtt
5341 ctttttagct gagatgacag attgcttctc tgtattaaat agtctagaag taagggtgtt
5401 ggtcacattt accatgtatt gtgttattag cagtttaaat ttatgaatat gttgttaaaa
5461 ttgtgttttt atatttcacg tcaaatgtaa aagttttatt ctctactatt gtacctgttg
5521 aaatacaaac cattttcacg gaaaaaatct tcaaaaacta ttaaatggat atcagcctga
5581 aaaaaaaaaa aaaaaaag

```

LOXL1 cDNA sequence (SEQ ID NO: 14)

NM_005576 Homo sapiens lysyl oxidase-like 1 (LOXL1), mRNA

```

1 gccagccgag cggccagcca gtgcgggggt ggccatgtaa ggccacagg cggtcctgce
61 cgcgcgggtg cctgcggaga gcctcgtgca gccttgaggc ccgcctctga cctgccttga
121 ccccttggcc ttgaatgct gtcatcggag gagccgtccc gctcgggaca aggcacattg
181 gacaaaagct agagctgggg caagcaaggc gccttctgtt cctcaggccc gtgggaagag
241 aagcacgccc agggggccac tctgagagc ctctctgtcc accaggcttc tgcagagggg
301 tcacatagtc tctgcccga ggcagccggc agctgggggg cctggtgtgg ggcgcctgce
361 tgtcggtgct ggtgcacggg cagcaggcgc agccccggga ggcctcggac ccgcgcctgt
421 ggcgcagcgt gatccagtgg gagaacaacg gccaggtgta cagcttgctc aactcgggtt
481 cagagtagct gccggccgga cctcagcgct ccgagagttag ctcccgggtg ctgtgtggcc
541 gcgcgcccc agccagcagc cggcgccagc acgggagccc ccggcgctgg caggcccggt
601 cctcgcctct cgcggggcgc gtgggctcgg acaccgtgcy cgcgcaaggc cggcaccctt
661 tcggcttttg ccaggtgccc gacaactggc gcgaggtggc cgtcggggac agccagggga
721 tggccctggc ccgcacctcc gtctccagc aacggcagg ggctcgcgcc tctcgtgtct
781 cggcttcggc cttgcaccgc acctaccgac agcagccctc ctaccggcag cagttccctt
841 acccgacagg gccctctgtc agccagtacg agaactacga ccccgctcgc cggacctaag
901 accaggggtt cgtgtactac cggcccgctg gcggcgcgct ggccgccccg gcggcgccgc
961 tggcctcggc ggggggtcac taccctacc agccccgggc gcctacagag gagtacggcg
1021 gcggcgaaga gctgcgccag taccgcctc agggcttcta cccggccccg gagagccctt
1081 acgtgcgcgc gccgcgcgcg cccccgagc gctggagcc cgcctactgc cacagtctgt
1141 acagcagagg cacccccggc ttgcagcagg cctaccctga cccgggtccc gagcgcgccg
1201 aggcceatgg cggagaccga cgcctgggct ggtaccgcgc ctacgccaac ccgcgcgccg
1261 agggctacgg gccgcgcgcg cgcgtggagc gcctctacct gcgggtgcgc agtcgcgaca
1321 gcccccgcgc ggggtgggag gcgaaaggcg cgcagcaggg ccgctcagag gttagcggtg
1381 tgcacggccc caaccagaa cggccgggtc tcctgtactt gggtccagac cccaactatg
1441 tgcacgcatc cacttatgtg cagagagccc acctgtactc cctgctactg cctcgtatgt
1501 agaagtgtct ggccagcaca gcctatgccc ctgagggcac cgactacgat gttcggtgtc
1561 tactgcgctt cccccagcgc gtgaagaacc agggcagcac agacttcttc cccaactcag
1621 caccgcacac ctgggagtgg cacagctgcc accagcat ta ccaagcatgt gacgagtta
1681 gccactacga cctactggat gcagccacag gcaagaaggt ggcccgaggc cacaaggcca
1741 gttctctgct ggaggacagc acctgtgact tcggcaacct caagcgctat gcatgcacct
1801 cttcatccca gggcctgagc ccaggtgctc atgacacct caatcgagac atcgactgac
1861 agtggtatcg cataaccgac gtgcagcctg ggaactacat cctcaaggtg cacgtgaacc
1921 caaagtatat tgttttgag tctgaattca ccaaacatct ggtgtagcgt aacatctact
1981 acacaggtcg ctacgtttct gcaacaaact gcaaaattgt ccaactctga tctccgggag
2041 ggacagatgg ccaatctctc ccttccaaa gcagcccgctg cctcccgggc agctcccggc

```

2101 cgagggggccc agcccccaac ccacaggcag ggagggggcat cccctccctgc cggcctcagg
2161 gagcgaacgt ggatgaaaac cacagggatt ccggatgcca gaccccatTT tatacttcac
2221 ttttctctac agtggttgttt tggttggtt ggtttttatt ttttatactt tggccatacc
2281 acagagctag attgccacag tctgggctga ataaaacaag gtttttct

CASPR4 cDNA sequence 1 (SEQ ID NO: 15)

NM_033401 Homo sapiens cell recognition protein CASPR4 (CASPR4), transcript variant 1, mRNA

```

1  tatataatttt  tatgatttttt  aaagratattt  catattctccc  tgtcttttaag  tttttcttttt
61  tctcatctgaa  ctactagacc  ttctagtaagc  agtcgggaagt  agtgaacatta  ttttttagaga
121  tcttagatgcc  tagtttttga  ttgtttgtgtt  ttactttgttg  gtgtttttgtg  ctatgtgattc
181  cagcaaaagcc  tcagactaaa  ctaaccctcaa  cgtggcatctg  ttctctctctg  cagatgactgc
241  tgaatgatcct  cttgtgtctg  ccttgccctca  gccatcctctc  agcagttctct  ccgagctctc
301  cagcagtcact  ggtcctggat  ttgcaaggct  gaatagaaga  gatggagctg  gtgctgtggtc
361  tccactttgtg  tctaacaagt  accagttggtt  gcagattgac  cttggagaga  gaatgagaggt
421  caccgctgtg  gccactcaag  ggggatattg  tagctccaac  tgggtgacca  gctacctctc
481  gatgtttcagt  gatagtggtc  ggaactggaa  acaatatcgc  caagaggaga  gcatctgggg
541  tttttcagga  aatgcaaatg  cagacagtgt  tgtgtactat  agactccagc  ctctctacaa
601  agccagatttt  ctgcgcttca  tcccttttga  atggaacccc  aaggggcagaa  ttggaatgcg
661  aatcgaaagt  ttcggatgtg  catcacagtc  agaagtgggt  gatcttgatg  gaaaaagtc
721  cctctctctac  agatttgatc  aaaaatccct  gagcccaata  aaagacatta  tttctttgaa
781  attcaaaacc  atgcagagtg  atgggatctc  actccacagg  gaagggccaa  atggagatga
841  catcacatac  caattaaaga  gagcaagact  ctttttactt  attaatctag  gtgaagctaa
901  actgccttcc  acttccaccc  tggctcaact  caccctgggc  agcctgctag  atgatcagca
961  ttggcatttca  gtgctctacc  agcctgttgg  caaacaaagt  aacttcacag  ttgacgaaac
1021  caggctcact  tctcatgcac  ggggagaatt  caactctcat  aatcttgat  atgagatcgc
1081  ctttgagggg  attccagcac  ctggaaaact  agtgtcattc  ccaatagata  attttcatgg
1141  atgtttagaa  aatctctatt  ataarggagt  ggatacatt  gatttggcca  acgacacaaa
1201  accacagatc  attgctattg  gaaatgtgtc  attttctgtg  tcaacaaccac  aatctatgcc
1261  cgtgactttt  ctgagctcca  ggagtattt  agcactgcca  gacttctctg  gagaggagga
1321  gtttctctgc  acttttcaat  ttgcaacttg  gaataaggca  gggctctctg  tgtctcagta
1381  actcagctgt  attcagggg  gtactcctct  ctttctgagt  gatggaaaac  ttaagtgcga
1441  tctctaccag  ccagaaaaat  taccagtgca  catcacagca  ggtgtcgat  taaatgatgt
1501  gcagtgcat  tctgtctctt  tatctgctaa  aaagaatcac  ttgagttggt  cgggtggacgg
1561  ccagattggt  tctgtctctc  ctctgtctgg  gcttgagcag  atttatctgg  ctggcaccta
1621  ttaatttggg  ggtgtctctg  acaaaaagct  ttgattccaa  tgtaaaagtc  cactgtgttg
1681  atttcaggga  tgtatgaggg  tcaattctat  cagcgggcaa  gtgtgatct  tgatttcagt
1741  tcagcagggg  tcccttggga  acttcagtga  ccttcagata  gactcatgtg  gcatctcaga
1801  caggtgtttt  ccaactatt  gtgaacacgg  tggggagtgt  tccagctctc  ggaagcactt
1861  tcaattgaac  gtaccaaca  ctggttacag  aggagctact  tgccataact  ctatctatga
1921  cgagtcactg  gaagcctata  agcacagagg  aaatacttca  ggggtttact  atatagattc
1981  agatggaagt  ggtcccttgg  aaccatttct  tctatttgc  aatatgaccg  aaactgcagt
2041  gaccatcata  cagcacaaag  gctctgactt  aacaagagtc  agaaatacta  atccagagaa
2101  cccatattgt  gggtttttgc  agtatgtggc  cagcatggag  caactctcag  ccaactttaa
2161  ccgtgcagag  cactgtgaac  aggaatttgc  ttattactgc  aagaagtac  ggcctgtcca
2221  taagcaagat  ggaacccctc  tgagtgtgtg  ggtaggagaa  accaatgaaa  gcgaacgtca
2281  ctggggaggt  tcttcgctgt  atcttcaaaa  atgtacttgt  ggat tagagg  gaaactgcgt
2341  tgattctcag  tattactgca  atttgtatgc  tagccggaat  gaatggacca  atctcactgt
2401  attgcttgc  tataaagaac  atcttccagt  aactaagatc  gtgattacag  acacagcccg
2461  actgcattca  gaagcagctt  ataaactggg  cctctctctc  tgccggggag  acagatactt
2521  ttggaattca  gcttctcttg  ataccgaggg  tctcatatct  cattttctca  ccttccacgg
2581  agaacttagc  cgggagtgtat  ctcttctttt  taagacaaca  gcttcatctg  ggggtatttt
2641  agagaacttg  gggattgctg  attttatcag  gatagagctt  cgctctccga  cagtatgac
2701  ttttctcatt  gatgtgggga  atgggcttct  tgaatactca  gtgcagtcac  ccacccactt
2761  caacgacac  cagtggtgac  atgtgaggtt  tgaaggagac  atgaaggagg  cctcccttca
2821  agtggatcag  ctgacaccaa  agacacagcc  gcgccctcgt  gatggagcgt  tctgtttaca
2881  gctcaacagt  cagctcttgc  tgggtggaac  gccccacaga  cagagagcgt  tctgtggctg
2941  cactcgtct  ctgcagttga  atgggattgac  ccttgatttg  gaagaaagag  cccaggtgac
3001  tccaggaagt  cagccaggtt  gtaggggaca  ttgcagcagc  tatgggaagt  tatgcccaga
3061  tggagggaaa  tgcagagaaa  gaccacttgg  ttctttttgt  gactgcactt  tctctgcat
3121  cacagggcca  tcttctctca  atgagatttc  tgcattattt  ggaactggct  cactcogtat
3181  atacaaattt  caagaaaatt  atcttltaa  gcttccaccc  agctcccagc  ctgcttcaat
3241  tcatggtgat  atgaagctga  gcagagaaat  gatcaaattt  agtttccgaa  caacacgaac
3301  accaagcttg  ctgctttttg  tgagctctct  ttcaaaagaa  tacccttctc  tgatcatgtc
3361  caaaaattga  agtttgcaga  tcaggtacaa  gtttaataaa  tatcaagagc  ctgatgtgtg
3421  taactttgat  tttaaaaaa  tggctgagtg  atcaacttcc  tacaataatga  ttaacagaga

```

```

3481 agaaggagtg gtctttatag agattgacga taatagaagg agacaagttc acctgtcatc
3541 aggcacagaa ttcatgtcag tcaaatctct caggtatggc aggtatttag aacacagtga
3601 ttgtggaccag gagactgcac tggcaggtgc gcagggtgtc acagggtgcc tctctgcagt
3661 ggcgtctcag cagctggccc ctctgaaggc agctctgcac cccagccacc gacacctgtc
3721 cactgttaca ggacacgtga ccgagtcacg ctgtatggcc cagcctggca ctgatgccac
3781 atcaaggaaa aggcacact cgttttcgga tcaattcggg acaatagatg acagagagcc
3841 ccttgctaatt gcaatcaaaa gtgactctgc agtaattgga ggctcgatag ctgttgtagt
3901 tttttatctt ctgtcatca ctgccatagc ttttcgcat tcatcagaga aaggttatata
3961 taaaagaagt gaggcaaaaa ggtcagagaa tgtagacagt gctgaggtgc ttctgaaagg
4021 tgaacttaat atcaaaaaat cagtcaatga aatatcagaa gagtactctc tctgattggc
4081 agctatgatt taacataaaa ttatgatagt ttgttttaat agccagggtg tctcaatgga
4141 aaaaagaatg ctcttacct gaatgtacag gcagtggtgc tgccagtcac ccatcttgcc
4201 atgtacagggc ttgggggtggc tccaggaaag ctcgtccagt gatataatc tcatagcatt
4261 cattctatgg aacaagaaat tagatattgc tgttaatttt caactgttct ggtatgattc
4321 aaaaagaatt taacctgctt aatggctaca gtttttacct gtgaaaactg tagccttggt
4381 ctcttaacca tgtaatacat aagttttgtt agaggtaaaa attaaatttg gactataatg
4441 tcttctgttt atttg

```

CASPR4 cDNA sequence 2 (SEQ ID NO: 16)

NM_138994 Homo sapiens cell recognition protein CASPR4 (CASPR4), transcript variant 2, mRNA

```

1 ctctttttct cttgagccg ccattgattct gaggccctcc cagctatgtg gaactatgac
61 tgtgatgac tcctttgttc tgccctgcct caggcatcct tcagcagttc tcccgagttc
121 tccagcagtc atggctcctg attttgcaag ctgaaataga gagatggagc tgggtggctg
181 tctccacttg tctctaaaca ataccagtg ttgcagattg acctggtagg agaatggag
241 gtccaccgtt tggccactca agggggataa ggtagctcca actgggtgac cagctacctc
301 ctgattgtta gtgtagtggt ctggaactgg aaacaatac gccaaagaga cagcatctgg
361 ggttttttcg gaaatgcaaa tgcagacagt gttgtgact atagactcca gccctctatc
421 aaagcagat tctgcgctt catcccttgc ccaagggtgc aatgggaagt
481 cgaatcgaag tgttcggatg tgcatacaga tcagaaatgg ttgatctga tggaaaaagt
541 tcccttctct acagatttga tcaaaaaatc ctgagcccaa taaaagacat tatctttt
601 aaattcaaaa ccatgcagag tgatgggatt ctactccaca gggaaaggcc aaatggagat
661 cacatcacac tgcaattaa aagagcaaga ctctttttac ttatttaatt aggtgaagct
721 aaactgccct ccaactccac cctggtcaat ctaccctgg gcagcctgct agatgatcag
781 catctggcatt cagtgcctat ccagcgttt ggcaaaacag tcaacttcac agtggacgaa
841 cacaggcatc atttccatgc acggggagaa ttcaattcca tgaattctga ttatgagatc
901 agctttggag ggaattccagc acctggaata tcagtgatcat tcccacatag aaattttcat
961 ggaatgttag aaaaatctta ttataatgga gtggatatca ttgatttggc caagcagcaa
1021 aaacacacaga ctaattgctat gggaaatgtg tcaattttgt tctcaaacac acactctatg
1081 cccgtgactt tctgagctc caggagttat ttgacactgc cagactctct tggagggag
1141 gaggtttctg ccaattttca atttcgaact tgaataaagg cagggtctct gctgttcagt
1201 gaacttcagg tgatttcagg gggtatcctc ctctttctga gtgatggaaa acttaagtgc
1261 aatctctacc agccaggaaa attaccagtg gacatcacag caggtgtctga attaaatgc
1321 gggcagtggt attctgtctc ttatctgct aaaaagaatc acttgagtgt ggcgctggac
1381 ggccacacag cttctgctgc tccctctgct ggcctgagc agattttatc ggtggaccac
1441 tattattttg gaggtgttgc tgacaaaagc ttgtgatcca aatgtaaaag tccacttggt
1501 ggaatttcagg gatgtatgag gctcatttct atcagcgcca agtggtaga tctgatttca
1561 gtcagcagg ggtcccttgg gaacttcaat gaccttcaga tagactctat tggcatctca
1621 gacgtgtgtt tgcccaacta ttgtgaacac ggtggggagt tctccagtc aggtatgac
1681 ttctactgta actgtacca cactggttac agaggagcta ctggcataa cttatctat
1741 gagcagtcag gtgaagccta taagcacaga ggaataactc cagggtttta ctatagat
1801 tcagatggaa ttggtccctt ggaaccattt cttctatat gcaatatgac cgaacttcga
1861 tggaccatca tacagacaaa cgctctgac ttacaagaag tcagaaatac taatccagag
1921 aaccatatt ctgggttttt cgagtatgtg ccagcagtcg agcaactcca gccactatt
1981 aacgtgcag agcactgtga acaggagttt acttattac tgaactttaa acgctgggtc
2041 aataagcaag atggaacccc tctgatttga tgggtagaaa gaaccaatga aacgcaaac
2101 tactggggag gttcttcgcc tgactctcaa aagatgactt ttggtatgag gggaaactgc
2161 attgattctc agttattact caattgtgat gctgaccgga attaactgtg atttccatc
2221 gatttcttta tgcaagaaaa agttcattta aaaaaattaa tcaactcaag tatgtatagc

```


2281 tagccagata ctgaacaagt tagtgcaatg aagtaattaa ataaaggttt gttttaatg

GPR50 cDNA sequence (SEQ ID NO: 17)

NM_004224 Homo sapiens G protein-coupled receptor 50 (GPR50), mRNA

```

1  tgtttgctgt  ctggacctgg  ctgctgatcc  tgagcctgct  gggagatctt  aacgaccccc
61  aggagcaaca  tggggccacc  cctagcggtt  cccacccccc  atggctgtat  tggctgtaat
121  ctaccccagc  cagaataccc  accggctcta  atcatcttta  tttctgcgc  galgttatc
181  accatcggtt  tagacctaat  cggcaacctc  atggtcattt  tggctgtgac  gaagaacaa
241  aagctccgga  attctggcaa  catcttcgtg  gtcagtctct  ctgtggccga  latgctggtg
301  gccatctacc  catacccttt  gatgctgcat  gccatgtcca  ttggggggcg  ggaatgagc
361  cagttacagt  gccagatgg  cgggttcatt  acagggctga  gtgtggtcgg  ctccattctc
421  aacatcgctg  caatcgctat  caaccgttac  tgctacatct  gccacagcct  ccagtcagaa
481  cggatctcca  gtgtggcgaa  taacctgcat  taacctggta  taacctggat  catgaccgtc
541  ctggctgtcc  tgccaaacat  gtacattggc  accatcgagt  acgatctcg  caccataacc
601  tgcattctca  actatctgaa  caacctgtc  ttcaactgta  ccactcgtc  catccacttc
661  gtctcccttc  tctcatcgt  gggttctgtc  tacgtgagga  tctggaccaa  agtgcctggc
721  gccctgagcc  ctgcaggcca  gaatcctgac  aaccaactg  ctgaggttgc  caatttcta
781  accatgtttg  tgatcttct  cctctttgca  gtgtgctggt  gccctatcaa  cgtgctcaat
841  gctcttggtg  ctgtcagtc  gaaggagatg  gcaggcaaga  tccccaaact  gctttatctt
901  gcagcctaact  tcatagccta  cttcaacagc  ctgtgatcta  cgggtctctc  cgtgctcaat
961  aatgagaatt  tccgaagaga  ataactggac  atcttccatg  ctatgcggca  cccatcataa
1021  ttcttccctg  gccctcatcg  tgatattcgt  gagctcagag  aggcctgac  cctggccgcg
1081  gccctgctcc  atgctcgcga  ccaagctcgt  gaacaaagcc  gtgcccactc  ctgctcgtct
1141  gttcgaggaa  cccgatgaa  tgtccggaat  ttccattac  cctggtagtc  tgcagctggc
1201  caccgccagc  gtgcctctgg  ccaacctaa  cccatttcca  gatcctctc  tgccatcgc
1261  aaatctgctt  ctaccacca  caagctgttc  tttagcact  ccaaggctgc  cctgtgtcac
1321  ctcaagctgt  tctctggcca  ctccaagcct  gccctctgtc  accccaagtc  tgccactgtc
1381  taacctaaag  ctgcctctgt  ccatttcaag  ggtgactctg  tccattcaa  ggtgtgactt
1441  gtccatttca  agcctgactc  tgttcatctt  aagcctgctt  ccagcaaccc  caagcccaat
1501  actggccacc  atgtctctgc  tggcagccac  tccaagctgc  ccttcagctg  tgccaccagc
1561  caccctaaac  ccatcaagcc  agctaccagc  catgctgagc  ccaaccactg  tgactatccc
1621  aagcctgcc  ctaccagcca  cctaaagccc  gctgctgctg  acaacctga  gctctctgcc
1681  tccattgccc  ccgagatccc  tgccattgcc  caccctgtgt  ctgacgacag  tgacctctct
1741  gagtcggcct  ctgacccctg  cgtggggccc  accaagcctg  ctgcccagca  gctggagctt
1801  gacacccatg  ctgaccttcc  tgacctact  gtagtcacta  ccagtaacca  tgattaccat
1861  gatgtcgtgg  ttgttgatgt  tgaagatgat  cctgatgaaa  tggctgtgtg  aaaaatgctc
1921  tcgtaggctg  ccaggcagt

```

[0289] Following are amino acid sequences for *PADI2* (SEQ ID NO: 18), *APOB* (SEQ ID NO: 19), *IL1RL2* (SEQ ID NO: 20), *WASPIP* (SEQ ID NO: 21), *BVES* (SEQ ID NO: 22), *PELI2* (SEQ ID NO: 23), *LOXL1* (SEQ ID NO: 24), *CASPR4* (SEQ ID NO: 25 and 26) and *GPR50* (SEQ ID NO: 27).

PADI2 amino acid sequence (SEQ ID NO: 18)

NP_031391 peptidyl arginine deiminase, type II, protein arginine deiminase [Homo sapiens]

MLRERTVRLQYGSRVEAYVVLGTYLWTDVYSAPAGAQTFSLKHSEHVWVEVVRDG
EAEEVATNGKQRWLLSPSTTLRLVMTSQASTEASDDKVTVNNYDEGSIPIQAGLFLTAI
EISLDVDADRGVVEKNNPKKASWTWGPEQGAILLVNDRPWLKPEDCRNDEKVV
SKEDLKDMSQMILRTKGPDRLPAGYEIVLYISMSDSKVGVFYVENPFFGQRYIHILGRR

KLYHVVKYTGGSSELLFFVEGLCFPDGEGFSLVSIHVSLLLEYMAQDIPLTPIFTDTVIFRI
APWIMTPNLPVSVFVCCMKDNYLFLKEVKNLVEKTNCELKVCFYQYLNRGDRWQDE
IEFGYIEAPHKGFPVVLDSPRDGNLKDFFVKELLGPDFGYVTREPLFESVTSLSDFGNLE
VSPPTVNGKTYPLGRILIGSSFPLSGGRRMTKVVRDFLKAQQVQAPVELYSDWLTVGH
VDEFSMFVIPGTKKFLLLMASSTACYKLFREKQKQDGHGEAIMFKGLGGMSSKRITINKI
LSNESLVQENLYFQRCLDWNRLDKKELGLTEQDIIDLPAFLKMADEDHFRAMDFPNMVN
MIVLDKDLGIPKFPQVVEEECCLEMHVRGLLEPLGLECTFIDDISAYHKFLGEVHCGTN
VRRKPFTFKWLHMPV

APOB amino acid sequence (SEQ ID NO: 19)

NP_000375 apolipoprotein B precursor; apoB-100; apoB-48 [Homo sapiens]

MDPPRPALLALLALPALLLLLLAGARAEEMLENVSLVCPKDATRFKHLRKYTYNYEA
ESSSGVPGTADRSRATINCKVELEVPQLCSFILKTSQCTLKEVYGFNPBGKALLKTKN
SEEFAMMSRYELKLAIPGKQVFLYPEKDEPTYILNIKRGIIISALLVPPEEAKQVLF
DTVYGNCSHTFTVKTRKGNVATEISTERDLGQCDFRFPKPIRTGISPLALIKGMTRPLSTLIS
SSQSCQYTLDAKRKHVAEAIKCEQHLFLPFSYNNKYGMVAQVTQTLKLEDTPKINSRFF
GEGTKMGLAPESTKTSPPKQAEAVLKTQLKELKLTISEQNIQRANFNKLVTELRGLS
DEAVTSLPLQLIEVSSPITLQALVQCQGPQCSTHILQWLKRVHANPLLDVVTYLVALPIE
PSAQLREIFNMARDQRSRATLYALSHAVNNYHKTNPVTGTQELLDIANYLMEQIQDDC
TGDEDYTYLILRVIGNMGQTMELQTPELKSSILKCVQSTKPSLMIQKAAIQALRKMEPK
DKDQEVLLQTFLLDDASPGDKRLAAYLMLMRSPSQADINKIVQILPWEQNEQVKNFVAS
HIANILNSELDIQLDKLVKEALKESQLPTVMDFRKFSRNYQLYKSVSLPSLDPASAKI
EGNLFDPNPNYLPKESMLKTTLTAFGFASADLIEIGLEGKGFEPTLEALFGKGFFDSVN
KALYWVNGQVPDGVSKVLVDHFGYTKDDKHEQDMVNGIMLSVEKLIKDLKSKEVPE
ARAYLRLIGELGFASLHDLQLLGLKLLMGARTLQGIQPMIGEVIRKGSKNDDFLHYIFM
ENAFELPTGAGLQLOISSSGVIAPGAKAGVKLEVANMQAELVAKPSVSVEFVTNMGIHP
DFARSGVQMNTNFFHESGLEAHVALKAGKLFKFIIPSPKRPVKLLSGGNTLHLVSTTKTE
VIPPLIENRQSVSVCKQVFPGLNYCTSGAYSNASSTDSASYPLTGDRLELELRPTGEIE
QYSVSATYLDQREDRALVDLTQFVTAEGAKQTEATMTQSGNMTLSERQVQIPDF
VDLGTILRVNDESTEGKTSYRLTLDIQNKKITEVALMGHLSCDTKEERKIKGVISIPRLQA
EARSEILAHWSAPAKLLQMDSSATAYGSTVSKRVAWHYDEEKIEFEWNTGTNVDTKK
MTSNFPVLDLSDFYPKSLHMYANRLDHRVPETDMTFRHVPEDLVAAMSSWLQKASGSLP
YTQTLQDHLNSLKEFNLQNMGLPDFHIPENFLKSDGRVKYTLNKNLSLKIEIPLPFGGKS
SRDLKMLETVRTPALHFKSXVGFHLPSPREFQVPTFTIPKLYQLQVPLGLVLDLSTNVYSNL
YNWSASYSGGNTSTDHFSLRARYHMKADSVVDLLSYVQSGGETTYDHNKNTFTLSD
GSLRHKFLDSNLIKFSHVEKLGNPNVSKGLLIFDASSSWGPMQMSASVHLSKSKKQHLFVK
EVKIDGQFRVSSFYAKGTGYLSCQRDPNTGRNLNGESNLRNFSYQGTNQTGRYEDGT
LSLSTSDLSQSGIKNNTASLKYENYELTLKSDTNGKYKNFATSNKMDMTFSKQNALRS
EYQADYESLRFFSLLSGSLNSHGLELNADILGTDKINSGAHKATLRIQDQDISTSATTNL
KCSLLVLENELNAGELGSLGASMKLTNNGRFREHNAKFSLDGKAALTELSLGSAYQAMI
LGVDSKNFNFKYSQEGFLKSNDDMMGSYAEMKFDHTNSLNSIAGKMLDFTSLDNYSSD
KFYKQTVNLQLPQYSVLVTTLNSDLKYNALDLTNNGLRLRLEPLKLHVAGNLKGAYQNN
EIKHIYAISAAALSASYKADTVAKVQGVFESHRLNTDIAGLASAIDMSTNYNSDSLHFSN

VFRSVMAPFTMTIDAHTNGNGKLALWGEHTGQLYSKFLKAEPLAFTFSHDYKGSTSH
HLVSRKSISAALHEKVSALLTPAEQTGTWKLKTQFNNNEYSQDLDAYNTKDKIGVELT
GRTLADLTLLDSPIKVPLLLSEPINIDALEMRDAVEKPEQFTIVAFVKYDKNQDVHSINL
PFFETLQEYFERNRQTIIVVVENVQRNLKHINIDQFVRKYRAALGKLPQQANDYLSNSFN
WERQVSHAKEKLTALTCKYRITENDIQIALDDAKINFNEKLSQLQTYMIQFDQYIKDSY
DLHDLKIAIANIIDEIEKLSLDEHYHIRVNLVKTIHDLHLFIENDFNKSGSSTASWIGNV
DTKYQIRIQIEKQLQQLKRHIQNIHQHLAGKCLKHIEAIDVRVLLDQLGTTISFERINDVL
EHVKHFVINLIGDFEVAEKINAFRAKVHELIERYEVDQQIQVLMMDKLVELTHQYKCLKETI
QKLSNVLQQVKIKDYFEKLVGFIDDAVKKLNELSFKTFIEDVNFKFLDMLIKKLKSFYDH
QFVDETNDKIREVTQRLNGEIQALELPQKAEALKLFLEETKATVAVYLESJQDTKITLIIN
WLQEAALSSASLAHMKAKFRETLEDTRDRMYQMMDIQQELQRYLSLVGVQVYSTLVTYISD
WWTLAANKLTDFAEQYSIQDWAKRMKALVEQGFTVPEIKTILGTMPEFVSLQALQK
ATFQTPDFIVPLTDLRIPSQVINFKDLKNIKIPSRFSTPEFTILNTFHIPSFTIDFVEMKVKIIR
TIDQMNSHELQWVPVDIYLRDLKVEDIPLARITLPDFRLPEIAIEFIPTLNLNDQFVDDL
HIPEQLPHISHTIEVPTFGKLYSILKIQSPLFLTDANADIGNGTTANEAGIASATKAGES
KLEVLNDFDQANAQLSNPKINPLALKESVKFSSKYLRTEHGSEMFLFFGNAIEGKSNTVAS
LHTEKNTLELSNGVIVKINNQLTDSNTKYFHKLNIPKLFDSQADLRNEIKTLTKAGHI
AWTSSGKGSWKACPRFDEGHESQISFTIEGPLTSFGLNSKINSHLRVNQNLVYES
GSLNFSKLEIQSQVDSQHVGHSVLTAKGMAFLGEGKAFTGRHDAHLNGKVIOTGLKNS
LFFSAQPFETIASTNNEGKLVRFPLRLTGKIDFLNNYALFLSPSAQQASWQVSARFNQY
KYNNQNSAGNENIMEAHVGINGEANLDFLNIPLTIPEMRLPYTIHTPPLKDFSLWEKTD
LKEFLKTTKQSFDSLVAQYKKNKHRHSITNPLA VLFCEFSIQSIKFDHRFEKNRNNALD
FVTKSYNETKIKFDKYKAEKSHDELPRTFQIPGYTVPVNVVEVSPTIEMSFAFGYVFPKA
VSMPSFSLGSDVRVPSYTLTLPSELPLVLHVPRNLKLSLPHFKELCTISHIFIPAMGNITYD
FSFKSSVITLNTNAELFNQSDIVAHLLSSSSSVIDALQYKLEGTTRLTKRGRGLKLATLSL
SNKFVEGSHNSTVSLTTKNMEVSVAKTTKAEIPLRMNFKQELNGNTKSKPTVSSSMEF
KYDFNSMMLYSTAGGAVDHKLSLESLSYFSIESSTKGDVKGSVLSREYSGTIASEANTY
LNSKSTRSSVKLQGTSKIDDIWNLEVKENFAGEATLQRIYSLWEHSTKNHLQLEGLFFT
NGEHTSKATLELSPWQMSALVQVHASQPPSFHDFPDLGQEVALNANTKNQKIRWKNE
VRHSGSFQSQVELSNDQEAHLDIAGSLGHLRLFLKNIILPVYDKSLWDFLKLDTTSI
GRRQHLRVSTAFVYTKNPNGYSFSPVVKVLADKFITPGLKLNLDNSLVLMPTFHVFPFTD
LQVPSCKLDLFREIYIKKLRTSSFALNPLTLPVVKFPEVDVLTKYSQPEDSLIPFFETVPES
QLTVSTDLTPKSPDGIADALDNVANKIADFELPTIIVPEQTIEIPSIFKSVPAAGIVSFQA
LTARFEVDSPVYNATWSASLKNKADYVETVLDSTCSSTVQLEYLEYELNVLGTHKIEDGTL
ASKTKGTLAHRDFSAYEEDGKFEGLEWEGKAHLNLIKSPAFTDLHLRYQKDKKGISTS
AASPAGVTGMDMDVEDGSKWNFYSSPQSSPDKLTIFKTELVRRESDEETQIKVNW
EEEEASGLLTSKLDNVPKATGVLYDYVNKYHWEHTGLTLREVSSKLRRNLQNNAEVW
YQGAIRQIDDDIVRFQKASGTTGTQYQEWKDKAQNLQYQELLTQEQQASFGQLKDNVFD
GLVRVTKGFHKMKVKHLIDSLDFLNFPRFPQPKGIYTRRELCTMFIREVGTVLSQVYS
KVHNGSEILFSYQDVLITLPLFELRKHLIDVISMYRELLDKLSKEAQVFKAIQSLKTTTE
VLRNLQDLQLQIFQIEDNIKQLKEMKFTYLYNYIQDEINTVNDYIPYVFKLLKENLCLNL
HKFNEFIQNELQESQELQIHQYIMALELREEYFDPISIVGWTFVYVLEEKIVSLIKNLLV
ALKDFHSEYIVSASNFTSLSSQVEQFLHRNIQEYLSILTPDGKGKEKIAELSAQIEHK
SQAIATKKIISDYHQQFQRYKLQDFSDQLSDYYEKFIAESKRLLDLSIQNYHTFLIYITELKK
KLQSTTVMNPMYMKLAPGELTIIIL

PELI2 amino acid sequence (SEQ ID NO: 23)

NP_067078 pellino 2 [Homo sapiens]

MFSPGQEEHCAPNKEPVKYGELVVLGYNGALPNGDRGRRKSRFALYKRPKANGVKPS
 TVHVISTPQASKAISCKGQHSISYTLNRNQTVVVEYTHDKDMDMFQVGRSTESPIDFVVT
 DTISGSQNTDEAQITQSTISRACRIVCDRNEPYTARIFAAGFDSSKNIFLGEKAAKWKNP
 DGHMDGLTTNGVLVVMHPRGGFTEESQPGVWREISVCGDVYTLRETRSAQQRGKLVES
 ETNVLDQDGLIDLGCATLLWRTADGLFHTPTQKHIEALRQEINAARPCQPVGLNTLAFPS
 INRKEVVEEKQPWAYLSCGHVHGYNWGHRSDEANERECMCRVTGPGYVPLWLGC
 EAGFYVDAGPPTHAFTPCGHVCSEKSAKYWSQIPLPHGTHAFHAACPFCATQLVGEQN
 CIKLIFQGPID

LOXL1 amino acid sequence (SEQ ID NO: 24)

NP_005567 lysyl oxidase-like 1 [Homo sapiens]

MALARGSRQLGALVWGACLCVLVHGGQAQPGQSDPARWRQLIQWENNGQVYSLN
 SGSEYVPAGPQRSESSSRVLLAGAPQAQRRSHGSPRRRQAPSLPLPGRVGS DTVRGQA
 RHPFGFGQVPDNWREVA VGDSTGMALARTSVSQRRHGSASSVSASAFASYQQPSY
 PQQFPYQAPFVSQYENYDPASRTYDQGFVYYRPAAGGVGAGAAVASAGVIYPYQPR
 ARYEYEGGGEELPEYPPQGFYAPERPYPVPPPPPPDGLDRRYSHSLYSEGTPGFEQAYP
 DPGPEAAQAHGGDPRLGWYPPYANPPEAYGPRALEPPYLPVRSSDTPPPGGERNGAQ
 QGRLSVGSVYRPNQNGRGLPDLVDPDNYVQASTYVQRAHLYSLRCAEEKCLASTAY
 APEATDYDVRVLLRFPQRVKNQGTADFLPNRPRHTWEHWSCHQHYHSMDEFSHYDLL
 DAATGKKVAEGHKASFCLDEDSTCDFGNLKRYACTSHTQGLSPGCYDTYNADIDCQWID
 ITDVQPGNYILKVHVNPKYIVLESDFTNNVVRCNIHYTGRYVSATNCKIVQS

CASPR4 amino acid sequence 1 (SEQ ID NO: 25)

NP_207837 cell recognition protein CASPR4 isoform 1; contactin associated protein-like 4 [Homo sapiens].

MLLFYLLVLSIDSTKASALTNPVVALFLLADDCDDPLVSALPQASFSSSSELSSSHGPGF
 ARLNRRDAGAGWWSPLVSNKYQWLQIDLGERMEVTA VATQGGYGSNNVWTSYLLMFS
 DSGWNWKYQRQEDSIWGFSGNANADSVVYYRLQPSIKARLFRIFLEWNPKGGRIGMRI
 EVFGCAYRSEVVDLDGKSSLLYRFDQKLSPIKDIIILKFKTMQSDGILLHREGPNGDHIT
 LQLRRARLFLINSGEAKLPSTSTLVNLTGSLDDQHWHSVLQRLGKQVNFVDEHR
 HHFHARGEFNLMNLDYEISFGGIPAPGKVSFPHRNHFHGCLENLYYNGVDIIDLAKQKQ
 PQIIAMGNVSFSCSQPQSMPTVFLSSRSYLALPDFSGEEVSA TFQFRTWNKAGLLLFSEL
 QLISGILLFLSDGKLKSNLYQPGKLPDITAGVELNDGQWHSVLSAKKNHLSVAVDG
 QMASAAPLLDQPEIYSGGTYYFGGCPDKSFGSKCKSPGLGGFQGCMLRISISGKVVVDLISV
 QQGSLNGFSDLDQSDSGISDRCLPNYCEHGGECSSQSWSTFHCCNTNTGYRGATCHNSIY
 EQSCEAYKHRGNTSGFFYYIDSDGSGPLEPFLLYCNMTETA WTIHQHNGSDLTRVRNTNP

ENPYAGFFEYVASMEQLQATINRAEHCEQEFTYYCKKSRLVNKQDGTPLSWVWGRTN
 ETQTYWGGSSPDQKCTCGLEGNICDSQYYCNCADNRNEWNTNDTGLLAYKEHLPVTKI
 VITDTGRLHSEAAAYKLGPLLCRGDRSFWNSASFDTEASYLHFPFTHGELSADVSFFKTT
 ASSGVFLENLGIADFIIRIELRSPVTVVTFSDVGNPFEISVQSPHFNNDNQWHHVRVERN
 MKEASLQVDQLTPKTQPAPADGHVLLQLNSQLFVGGTATRQRGFLGCIRSLQLNGMTL
 DLEERAQVTPFVQPGCRGHCSYGLKLCRNGGKCRERPIGFCDCFTSAYTGPFCSNEISA
 YFGSGSSVIYNFQENYLLSKNSSSHAASFHGMKLSREMIKFSFRTRTPSLLLTVSSFFYK
 EYLSVIAKNGSLQIRYKLNKYQEPDVVNFDFKNMADGQLHHIMINREEGVVFIIDDNR
 RRQVHLSSGTEFSAVKSLVLGRILEHSDVDQETALAGAQQFTGCLSAVQLSHVAPLKA
 LHPSHPDPVTVTGHVTESSCMAQPGTDATSRERTHSFADHSGTIDDRPLANAIAKSDSA
 VIGGLIAVVFILLCITAIAVRIYQQKRLYKRSEAKRSENVDSEAVLKSELNIQNAVNEN
 QKEYFF

CASPR4 amino acid sequence 2 (SEQ ID NO: 26)

NP_620481 cell recognition protein CASPR4 isoform 2; contactin associated protein-like 4 [Homo sapiens]

MWNYDCDDPLVSALPQASFSSSSELSSSHGPGFARLNRRDAGAGWSPLVSNKYQWLQI
 DLGERMEVTA VATQGGYGSSNWVTSYLLMFSDSGWNWVKYRQEDSIWFGSGNANAD
 SVVYYRLQPSIKARFLRFIPLEWNPCKGRIGMRIEVFGCA YRSEVVDLDGKSSLLYRFDQK
 SLSPKIDILSKFKTMQSDGILLHREGPNGDHITLQLRRARLFLINSGEAKLPSTSTLVNL
 TLGSLDDQHWHSVLQRLGKQVNFVDEHRHHFHARGEFNLMNLDYEISFGGIPAPG
 KSVSFPHRNFGHCLENLYYNGVDIIDLAKQKPKQIIAMGNVSFSCSQPSQMPVTVLSSRS
 YLALPDFSGEEEVSAATFQFRWTWNKAGLLFSELQLISGGILLFLSDGKLKSNLYQPGKPL
 SDITAGVELNDGQWHSVLSAKKNHLSVAVDGMASAAAPLLGPEQIYSGGTYYFGGCP
 DKSFGSKCKSPLGGFGGCMRLISISGKVVDLISVQQGSLGNFSDQLIDSCGISDRCLPNYC
 EHGGECSQSWSTFHCNCTNTGYRGATCHNSIYEQSCEAYKHRGNTSGFYIIDSDSGSPL
 EPFLLYCNMTETAWTIIHQNGSDLTRVRNTNPENPYAGFFEYVASMEQLQATINRAEH
 CEQEFTYYCKKSRLVNKQDGTPLSWVWGRTNETQTYWGGSSPDQKCTCGLEGNICDS
 QYYCNCADNRNEW

GPR50 amino acid sequence (SEQ ID NO: 27)

NP_004215 G protein-coupled receptor 50 [Homo sapiens].

MGPTLAVPTPYGCIGCKLPQPEYPPALIIIFMFCAMVITIVVDLIGNSMVILAVTKNKKLR
 NSGNIFVVSLSVADMLVAIYPPPLMLHAMSIGGWDSLQLCQMVGFITGLSVVGSIFNI
 VALAINRYCYICHSLQYERIFSVRNTCIYLVITWIMTVLAVLPNMYIGTIEYDPRTYTCIFN
 YLNNPVFTVTVCIHFLVPLLIIVGFCYVRIWTKVLAARDPAGQNPNDQLAEVRNFLTMTF
 VIFLLFVAVCVCPINVLTVLVAVSPKEMAGKIPNWLYLAAYFIAFYNSCLNAVIVYGLLE
 NFRREYWTIFHAMRHPHIFFGPLISDIREMQEARTLARARAHARDQAREQDRAHACPAV
 EETPMNVNRNVPPLGDAAGHPDRASGHPKPHSRSSSAYRKSASTHHSVFSHKAASG
 HLKPVSGHSPASGHPKSATVYPKASVHFKGDSVHFKGDSVHFKPDVSHFKPASSNP

PITGHHVSAGSHSKSAFSAATSHPKPIKPATSHAEPPTADYPKPATTSHPKPAAADNP
SASHCPEIPAIAHPVSDSDLPEASSPAAGPTKPAASQLESDTIADLPDPTVVTTSTNDY
HDVVVVDVEDDPDEMAV

[0290] Modifications may be made to the foregoing without departing from the basic aspects of the invention. Although the invention has been described in substantial detail with reference to one or more specific embodiments, those of skill in the art will recognize that changes may be made to the embodiments specifically disclosed in this application, yet these modifications and improvements are within the scope and spirit of the invention, as set forth in the aspects which follow. All publications or patent documents cited in this specification are incorporated herein by reference as if each such publication or document was specifically and individually indicated to be incorporated herein by reference.

[0291] Citation of the above publications or documents is not intended as an admission that any of the foregoing is pertinent prior art, nor does it constitute any admission as to the contents or date of these publications or documents. U.S. patents and other publications referenced herein are hereby incorporated by reference.

What is claimed is:

1. A method for identifying a subject at risk of osteoarthritis, which comprises detecting the presence or absence of one or more polymorphic variations associated with osteoarthritis in a nucleic acid sample from a subject, wherein the one or more polymorphic variations are detected in a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c);

whereby the presence of the polymorphic variation is indicative of the subject being at risk of osteoarthritis.

2. The method of claim 1, which further comprises obtaining the nucleic acid sample from the subject.

3. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions 21233000 to 21243000 in human genomic DNA.

4. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 1 selected from the group consisting of 238, 294, 295, 347, 1425, 4891, 5087, 7041, 7121, 7219, 7443, 7485, 10939, 11367, 11571, 11839, 12551, 12646, 13469, 14913, 15205, 15246, 15695, 17473, 17610, 17828, 18130, 18281, 18623, 18890, 21561, 23100, 23872, 24581, 24582, 24983, 27540, 30846, 31415, 31453, 31899, 37000, 38681, 39287, 42951, 45648, 46222, 46687, 47020, 47593, 48513, 49723, 49986, 53018, 53296, 53547, 53899, 53916, 53933, 54305, 55327, 55895, 56143, 56640, 58486, 59576, 63048, 64008, 64018, 64859, 65995, 66905, 67183, 67942, 68101, 68521, 68664, 68988, 69178, 72143, 74183, 74312, 74407, 75518, 76153, 77398, 77615, 79092, 80000, 80125, 80595, 81061, 81151, 81918, 83072, 83137, 83235, 83263, 83279, 83280, 83533, 86856, 87186, 87189, 87727, 87978, 89129, 89556, 89702, 90233, 93060, 94779, 95367, 95844, 95942, 96884, 96938, 97627, 97777, 97871, 98746 and 99663.

5. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 1 selected from the group consisting of 7219, 7485, 11839, 31899, 37000, 48513, 49986, 56640, 74407, 77398, 93060 and 97627.

6. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions 102456500 to 102471500 in human genomic DNA.

7. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 2 selected from the group consisting of 225, 509, 860, 874, 939, 1483, 1798, 2189, 2215, 2282, 2340, 2963, 3369, 3481, 3564, 3653, 4860, 4941, 4975, 5321, 5346, 5541, 5633, 6007, 6317, 6378, 6382, 6426, 6479, 6641, 6703, 6705, 7963, 8525, 8526, 8598, 8624, 8883, 8980, 13578, 16135, 16141, 16642, 16931, 17004, 17009, 17010, 18713, 18853, 20783, 21335, 22180, 22268, 22285, 25378, 25906, 26015, 26475, 26798, 27042, 27649, 27827, 27873, 28122, 28202, 28232, 28240, 29546, 29748, 30054, 30646, 31149, 36912, 36936, 37184, 39064, 39343, 40868, 40917, 41113, 47343, 47806, 47911, 48009, 48621, 49245, 49247, 49299, 49302, 49514, 49626, 49791, 50010, 50294, 51482, 51556, 51855, 51956, 52155, 52448, 52458, 52511, 52607, 54049, 54224, 54567, 55052, 55857, 55941, 56120, 56349, 56727, 57232, 58806, 61181, 63808, 64526, 64865, 64928, 64966, 65080, 65690, 66228, 66982, 72511, 74170, 74264, 74333, 74502, 74741, 75321, 82558, 85366, 85469, 86485, 87687, 89463, 89660, 95718 and 95821.

8. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 2 selected from the group consisting of 2215, 3369, 16642, 20783, 52155, 55052, 55941, 74333, 74741, 85366, 85469, 87687, 89660 and 95718.

9. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions positions 175647734 to 175655734 in human genomic DNA.

10. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 3 selected from the group consisting of 209, 5908, 7460, 7733, 7855, 7904, 8869, 9480, 13820, 15152, 17713, 17804, 18220, 19083, 19123, 19605, 20247, 20592, 21907, 23273, 23299, 23623, 23669, 23844, 24190, 24486, 24896, 25118, 30551, 30844, 30900, 30942, 31699, 32081, 35078, 36196, 36541, 38356, 45578, 49634, 49774, 51119, 51181, 51652, 54467, 55762, 55999, 57865, 66613, 68377, 69754, 72859, 76512, 76717, 77722, 80998, 82033, 89658, 89960, 94155 and 95679.

11. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 3 selected from the group consisting of 19083, 30900, 38356, 76512 and 94155.

12. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions 105595000 to 105615000 in human genomic DNA.

13. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 4 selected from the group consisting of 241, 801, 899, 2091, 2290, 2440, 4959, 7914, 7969, 7972, 10831, 12399, 13841, 14461, 14680, 16808, 18231, 18394, 18505, 18684, 19257, 20263, 20656, 21499, 21563, 21612, 21834, 22406, 22408, 22685, 23303, 23306, 25139, 25211, 25364, 25381, 25414, 25835, 26214, 27224, 27526, 27934, 28550, 29015, 29879, 29979, 30030, 30585, 31753, 31934, 33227, 33228, 35172, 36901, 36921, 36932, 37061, 37570, 38745, 38970, 39725, 40070, 40460, 41470, 41562, 41956, 42047, 42280, 42358, 42629, 43075, 43387, 43393, 43438, 44115, 44537, 45642, 46629, 47496, 47515, 48329, 48862, 48908, 49038, 49080, 50204, 50404, 50426, 50531, 50840, 50964, 50971, 51378, 52610, 53906, 53951, 54111, 54149, 55563, 55999, 58415, 58961, 60447, 61377, 61528, 61606, 62140, 62461, 63826, 64950, 65076, 66121, 66406, 67051, 68860, 69014, 70796, 72325, 73414, 75258, 76347, 76839, 77358, 77822, 77946, 80002, 80024, 80285, 80397, 82075, 82153, 83981, 84184, 85089, 85288, 85330, 85581, 85642, 86433, 86904, 88391, 89042, 90828, 92676, 92881, 94227, 94585, 94616, 94712, 94738, 95253, 95522, 95869 and 97856.

14. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 4 selected from the group consisting of 25414, 25835, 38970, 41470, 44115, 47496, 49038, 50204, 50840, 50964, 50971, 53906, 54149, 58415, 70796, 72325, 75258, 77822, 80002, 85288, 85581, 86904, 90828, 94616, 94712, 95869 and 97856.

15. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions 71957600 to 71962600 in human genomic DNA.

16. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 5 selected from the group consisting of 213, 249, 1824, 2057, 2306, 2869, 3976, 4288, 4290, 4434, 5298, 5467, 8486, 8487, 8831, 9036, 9058, 9131, 9732, 9862, 10191, 10270, 16167, 17620, 17751, 17764, 17787, 19401, 21021, 21902, 22173, 22416, 22653, 24945, 25011,

28563, 48574, 48710, 48880, 50194, 56343, 56455, 56729, 56759, 56895, 57036, 57702, 62515, 62629, 63501, 63547, 64876, 65073, 67149, 67549, 71660, 71906 and 71911.

17. The method of claim 1, wherein a polymorphic variation is detected at position 65073 in SEQ ID NO: 5.

18. The method of claim 1, wherein the one or more polymorphic variations are detected within a region spanning chromosome positions 76221000 to 76226000 in human genomic DNA.

19. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 6 selected from the group consisting of 205, 866, 4212, 5934, 11486, 16969, 22509, 22796, 28097, 28626, 28853, 28873, 30155, 30827, 31956, 32404, 32944, 35205, 35227, 35781, 41052, 45051, 46039, 47276, 47678, 47716, 51014, 54408, 54596, 56853, 61851, 62016, 62461, 68257, 69793, 73976, 73999, 74053, 75315, 75729, 76466, 77216, 77217, 79239, 80825, 81060, 81097, 81426, 84787, 84896, 85165, 86502, 86753, 86941, 88787 and 95598.

20. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in SEQ ID NO: 6 selected from the group consisting of 47716 and 69793.

21. The method of claim 1, wherein the one or more polymorphic variations are detected at one or more positions in linkage disequilibrium with one or more positions in claim 4, 7, 10, 13, 16 or 19.

22. The method of claim 1, wherein detecting the presence or absence of the one or more polymorphic variations comprises:

hybridizing an oligonucleotide to the nucleic acid sample, wherein the oligonucleotide is complementary to a nucleotide sequence in the nucleic acid and hybridizes to a region adjacent to the polymorphic variation;

extending the oligonucleotide in the presence of one or more nucleotides, yielding extension products; and

detecting the presence or absence of a polymorphic variation in the extension products.

23. The method of claim 1, wherein the subject is a human.

24. The method of claim 23, wherein the subject is a human female.

25. The method of claim 23, wherein the subject is a human male.

26. A method for identifying a polymorphic variation associated with osteoarthritis proximal to an incident polymorphic variation associated with osteoarthritis, which comprises:

identifying a polymorphic variation proximal to the incident polymorphic variation associated with osteoarthritis, wherein the polymorphic variation is detected in a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising a polymorphic variation;

determining the presence or absence of an association of the proximal polymorphic variant with osteoarthritis.

27. The method of claim 26, wherein the incident polymorphic variation is at one or more positions in claim 4, 7, 10, 13, 16 or 19.

28. The method of claim 26, wherein the proximal polymorphic variation is within a region between about 5 kb 5' of the incident polymorphic variation and about 5 kb 3' of the incident polymorphic variation.

29. The method of claim 26, which further comprises determining whether the proximal polymorphic variation is in linkage disequilibrium with the incident polymorphic variation.

30. The method of claim 26, which further comprises identifying a second polymorphic variation proximal to the identified proximal polymorphic variation associated with osteoarthritis and determining if the second proximal polymorphic variation is associated with osteoarthritis.

31. The method of claim 30, wherein the second proximal polymorphic variant is within a region between about 5 kb 5' of the incident polymorphic variation and about 5 kb 3' of the proximal polymorphic variation associated with osteoarthritis.

32. An isolated nucleic acid comprising a nucleotide sequence selected from the group consisting of:

- (a) a nucleotide sequence in SEQ ID NO: 1-17;
- (b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;
- (c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;
- (d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising a polymorphic variation; and

(e) a nucleotide sequence complementary to the nucleotide sequences of (a), (b), (c), or (d);
wherein the nucleotide sequence comprises a polymorphic variation associated with osteoarthritis selected from the group consisting of in SEQ ID NO: 1 an adenine at position 7219, a guanine at position 7485, an adenine at position 11839, a thymine at position 31899, an adenine at position 37000, a cytosine at position 48513, a guanine at position 49986, a guanine at position 56640, a cytosine at position 74407, a guanine at position 77398, an adenine at position 93060 and an adenine at position 97627; in SEQ ID NO: 2 an adenine at position 2215, a deletion at position 3369, a deletion at position 16642, a cytosine at position 20783, a cytosine at position 52155, a cytosine at position 55052, a cytosine at position 55941, a thymine at position 74333, an adenine at position 74741, a deletion at position 85366, a thymine at position 85469, a thymine at position 87687, an adenine at position 89660 and a cytosine at position 95718; in SEQ ID NO: 3 a thymine at position 19083, a guanine at position 30900, an adenine at position 38356, an adenine at position 76512 and an adenine at position 94155; in SEQ ID NO: 4 an adenine at position 25414, a cytosine at position 25835, an adenine at position 38970, an adenine at position 41470, an adenine at position 44115, a guanine at position 47496, a cytosine at position 49038, an adenine at position 50204, a thymine at position 50840, a cytosine at position 50964, a cytosine at position 50971, an adenine at position 53906, a guanine at position 54149, a guanine at position 58415, a thymine at position 70796, a guanine at position 72325, a cytosine at position 75258, an adenine at position 77822, an adenine at position 80002, an adenine at position 85288, an adenine at position 85581, a guanine at position 86904, a guanine at position 90828, an adenine thymine adenine adenine sequence at position 94616, a cytosine at position 94712, a guanine at position 95869 and a cytosine at position 97856; a guanine at position 65073 in SEQ ID NO: 5; and an adenine at position 47716 and a thymine at position 69793 in SEQ ID NO: 6.

33. An oligonucleotide comprising a nucleotide sequence complementary to a portion of the nucleotide sequence of (a), (b), (c), or (d) in claim 32, wherein the 3' end of the oligonucleotide is adjacent to a polymorphic variation associated with osteoarthritis.

34. A microarray comprising an isolated nucleic acid of claim 32 linked to a solid support.

35. An isolated polypeptide encoded by the isolated nucleic acid sequence of claim 32.

36. A method for identifying a candidate therapeutic for treating osteoarthritis, which comprises:

(a) introducing a test molecule to a system which comprises a nucleic acid comprising a nucleotide sequence selected from the group consisting of:

(i) a nucleotide sequence in SEQ ID NO: 1-17;

(ii) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(iii) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(iv) a fragment of a nucleotide sequence of (a), (b), or (c); or

introducing a test molecule to a system which comprises a protein encoded by a nucleotide sequence of (i), (ii), (iii), or (iv); and

(b) determining the presence or absence of an interaction between the test molecule and the nucleic acid or protein,

whereby the presence of an interaction between the test molecule and the nucleic acid or protein identifies the test molecule as a candidate therapeutic for treating osteoarthritis.

37. The method of claim 36, wherein the system is an animal.

38. The method of claim 36, wherein the system is a cell.

39. The method of claim 36, wherein the nucleotide sequence comprises one or more polymorphic variations associated with osteoarthritis.

40. The method of claim 39, wherein the one or more polymorphic variations associated with osteoarthritis are at one or more positions in claim 4, 7, 10, 13, 16 or 19.

41. A method for treating osteoarthritis in a subject, which comprises contacting one or more cells of a subject in need thereof with a nucleic acid, wherein the nucleic acid comprises a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;
(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c); and

(e) a nucleotide sequence complementary to the nucleotide sequences of (a), (b), (c), or (d);

whereby contacting the one or more cells of the subject with the nucleic acid treats the osteoarthritis in the subject.

42. The method of claim 41, wherein the nucleic acid is RNA or PNA.

43. The method of claim 42, wherein the nucleic acid is duplex RNA.

44. A method for treating osteoarthritis in a subject, which comprises contacting one or more cells of a subject in need thereof with a protein, wherein the protein is encoded by a nucleotide sequence which comprises a polynucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c);

whereby contacting the one or more cells of the subject with the protein treats the osteoarthritis in the subject.

45. A method for treating osteoarthritis in a subject, which comprises:

detecting the presence or absence of one or more polymorphic variations associated with osteoarthritis in a nucleic acid sample from a subject, wherein the one or more polymorphic variation are detected in a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising a polymorphic variation; and

administering an osteoarthritis treatment to a subject in need thereof based upon the presence or absence of the one or more polymorphic variations in the nucleic acid sample.

46. The method of claim 45, wherein the one or more polymorphic variations are detected at one or more positions in claim 4, 7, 10, 13, 16 or 19.

47. The method of claim 45, wherein the treatment is selected from the group consisting of administering a corticosteroid, a nonsteroidal anti-inflammatory drug (NSAID), a cyclooxygenase-2 (COX-2) inhibitor, an antibody, a glucocorticoid, hyaluronic acid, chondroitin sulfate, glucosamine or acetaminophen; prescribing a heat/cold regimen or a joint protection regimen; performing joint surgery; prescribing a weight control regimen; and combinations of the foregoing.

48. A method for detecting or preventing osteoarthritis in a subject, which comprises:
detecting the presence or absence of one or more polymorphic variations associated with osteoarthritis in a nucleic acid sample from a subject, wherein the polymorphic variation is detected in a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising a polymorphic variation; and

administering an osteoarthritis prevention or detection procedure to a subject in need thereof based upon the presence or absence of the one or more polymorphic variations in the nucleic acid sample.

49. The method of claim 48, wherein the one or more polymorphic variations are detected at one or more positions in claim 4, 7, 10, 13, 16 or 19.

50. The method of claim 48, wherein the osteoarthritis prevention is selected from the group consisting of administering a corticosteroid, a nonsteroidal anti-inflammatory drug (NSAID), a cyclooxygenase-2 (COX-2) inhibitor, an antibody, a glucocorticoid, hyaluronic acid, chondroitin sulfate, glucosamine or acetaminophen; prescribing a heat/cold regimen or a joint protection regimen; performing joint surgery; prescribing a weight control regimen; and combinations of the foregoing.

51. A method of targeting information for preventing or treating osteoarthritis to a subject in need thereof, which comprises:

detecting the presence or absence of one or more polymorphic variations associated with osteoarthritis in a nucleic acid sample from a subject, wherein the polymorphic variation is detected in a nucleotide sequence selected from the group consisting of:

(a) a nucleotide sequence in SEQ ID NO: 1-17;

(b) a nucleotide sequence which encodes a polypeptide encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(c) a nucleotide sequence which encodes a polypeptide that is 90% or more identical to the amino acid sequence encoded by a nucleotide sequence in SEQ ID NO: 1-17;

(d) a fragment of a nucleotide sequence of (a), (b), or (c) comprising a polymorphic variation; and

directing information for preventing or treating osteoarthritis to a subject in need thereof based upon the presence or absence of the one or more polymorphic variations in the nucleic acid sample.

52. The method of claim 51, wherein the one or more polymorphic variations are detected at one or more positions in claim 4, 7, 10, 13, 16 or 19.

53. A composition comprising a cell from a subject having osteoarthritis or at risk of osteoarthritis and an antibody that specifically binds to a protein, polypeptide or peptide encoded by a nucleotide sequence identical to or 90% or more identical to a nucleotide sequence in SEQ ID NO: 1-17.

54. The composition of claim 41, wherein the antibody specifically binds to an epitope comprising a threonine at position 98 in a *APOB* polypeptide.

55. A composition comprising a cell from a subject having osteoarthritis or at risk of osteoarthritis and a RNA, DNA, PNA or ribozyme molecule comprising a nucleotide sequence identical to or 90% or more identical to a portion of a nucleotide sequence in SEQ ID NO: 1-17.

56. The composition of claim 55, wherein the RNA molecule is a short inhibitory RNA molecule.

Abstract of the Disclosure

Provided herein are methods for identifying a risk of osteoarthritis in a subject, reagents and kits for carrying out the methods, methods for identifying candidate therapeutics for treating osteoarthritis, and therapeutic and preventative methods applicable to osteoarthritis. These embodiments are based upon an analysis of polymorphic variations in nucleotide sequences within the human genome.

FIGURE 1A

APOB – FEMALE P-VALUES

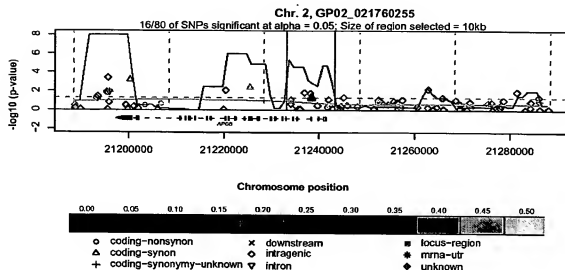


FIGURE 1B

IL1RL2 – DISCOVERY P-VALUES (female only)

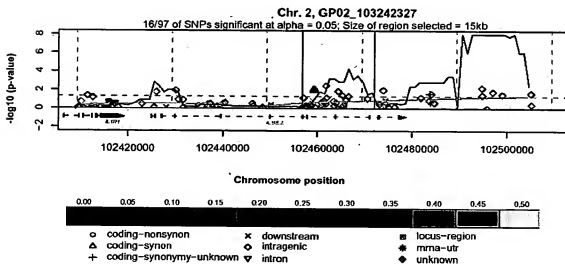


FIGURE 1C

WASPIP – DISCOVERY P-VALUES (female only)

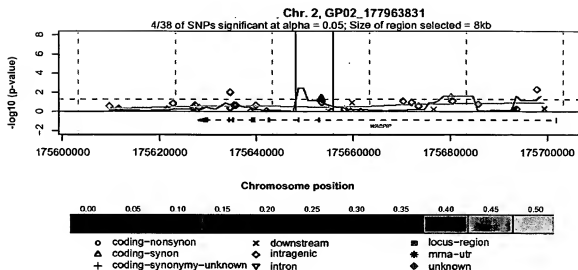


FIGURE 1D

BVES – DISCOVERY P-VALUES (female only)

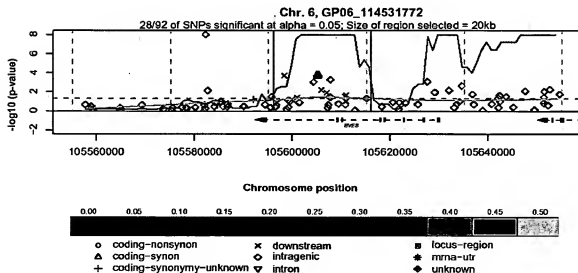


FIGURE 1E

LOXL1 – DISCOVERY P-VALUES (female only)

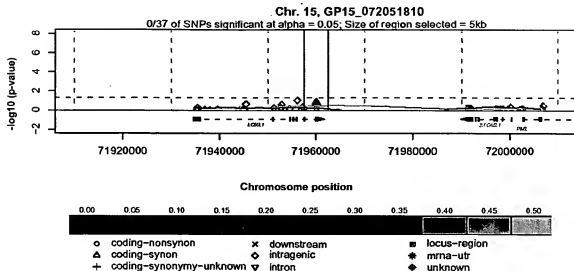
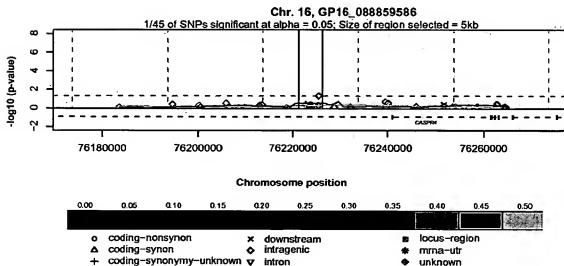


FIGURE 1F

CASPR4 – DISCOVERY P-VALUES (female only)



Application Data Sheet

Application Information

Application Type::	Provisional
Subject Matter::	Utility
Suggested Group Art Unit::	Not Yet Assigned
CD-ROM or CD-R?::	None
Sequence submission?::	None
Computer Readable Form (CRF)?::	No
Title::	METHODS FOR IDENTIFYING RISK OF OSTEOARTHRITIS AND TREATMENTS THEREOF
Attorney Docket Number::	524593008800
Request for Early Publication?::	No
Request for Non-Publication?::	No
Total Drawing Sheets?::	3
Small Entity?::	Yes
Petition included?::	No
Secrecy Order in Parent Appl.?::	No

Applicant Information

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Steven
Family Name::	MAH
City of Residence::	San Diego
State or Province of Residence::	CA
Country of Residence::	US
Street of mailing address::	12820 Via Nieve #74
City of mailing address::	San Diego
State or Province of mailing address::	CA

Postal or Zip Code of mailing address:: 92130

Applicant Authority Type:: Inventor
Primary Citizenship Country:: Germany
Status:: Full Capacity
Given Name:: Andreas
Family Name:: BRAUN
City of Residence:: San Diego
State or Province of Residence:: CA
Country of Residence:: US
Street of mailing address:: 3935 Lago Di Grata Circle
City of mailing address:: San Diego
State or Province of mailing address:: CA
Postal or Zip Code of mailing address:: 92130

Applicant Authority Type:: Inventor
Primary Citizenship Country:: Germany
Status:: Full Capacity
Given Name:: Stefan
Middle Name:: M.
Family Name:: KAMMERER
City of Residence:: San Diego
State or Province of Residence:: CA
Country of Residence:: US
Street of mailing address:: 3825 Elijah Court, Unit 334
City of mailing address:: San Diego
State or Province of mailing address:: CA
Postal or Zip Code of mailing address:: 92130

Applicant Authority Type:: Inventor
Primary Citizenship Country:: US
Status:: Full Capacity

Given Name:: Matthew
Middle Name:: Roberts
Family Name:: NELSON
City of Residence:: San Marcos
State or Province of Residence:: CA
Country of Residence:: US
Street of mailing address:: 1250 Calle Prospero
City of mailing address:: San Marcos
State or Province of mailing address:: CA
Postal or Zip Code of mailing address:: 92069

Applicant Authority Type:: Inventor
Primary Citizenship Country:: Sweden
Status:: Full Capacity
Given Name:: Rikard
Middle Name:: Henry
Family Name:: RENELAND
City of Residence:: San Diego
State or Province of Residence:: CA
Country of Residence:: US
Street of mailing address:: 7555 Charmant Drive, #1114
City of mailing address:: San Diego
State or Province of mailing address:: CA
Postal or Zip Code of mailing address:: 92122

Applicant Authority Type:: Inventor
Primary Citizenship Country:: United Kingdom
Status:: Full Capacity
Given Name:: Maria
Middle Name:: L.
Family Name:: LANGDOWN
City of Residence:: San Diego

State or Province of Residence:: CA
Country of Residence:: US
Street of mailing address:: 3701 Yosemite Street
City of mailing address:: San Diego
State or Province of mailing address:: CA
Postal or Zip Code of mailing address:: 92109

Correspondence Information

Correspondence Customer Number:: 25225

Representative Information

Representative Customer Number:: 25225